

Lumi United Technology Co., Ltd.

CE TEST REPORT

SCOPE OF WORK:

EMC directive (2014/30/EU) – EMC report

Model:

LEDS-K01, LEDS-K02, RLS-K01D, RLS-K02D

REPORT NUMBER

230401083SHA-003

ISSUE DATE

April 17, 2023

DOCUMENT CONTROL NUMBER

TTRF55015_V1

© 2020 Intertek



Report no. 230401083SHA-003

Applicant : Lumi United Technology Co., Ltd.
Room 801-804, Building 1, Chongwen Park, Nanshan iPark, No. 3370,
Liuxian Avenue, Fuguang Community, Taoyuan Residential District,
Nanshan District, Shenzhen, China

Manufacturer : Same as applicant

Manufacturing site : Same as applicant

Summary

The equipment complies with the requirements according to the following standard(s) or Specification:

EN IEC 55015:2019+A11:2020: Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment

EN 61547:2009: Equipment for general lighting purposes - EMC immunity requirements

EN IEC 61000-3-2:2019+A1:2021: Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current $\leq 16A$ per phase)

EN 61000-3-3:2013+A2:2021: Electromagnetic compatibility (EMC) - Part 3-3: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current $\leq 16A$ per phase and not subject to conditional connection

PREPARED BY:**REVIEWED BY:**

Project Engineer
Alexander Li

Reviewer
Wakeyou Wang

This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to permit copying or distribution of this report and then only in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test results in this report are relevant only to the sample tested. This report by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program.

Contents

REVISION HISTORY.....	6
MEASUREMENT RESULT SUMMARY	7
1. GENERAL INFORMATION	8
1.1 DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)	8
1.2 DESCRIPTION OF TEST FACILITY	9
2. TEST SPECIFICATIONS.....	10
2.1 NORMATIVE STANDARDS.....	10
2.2 MODE OF OPERATION DURING THE TEST.....	11
2.3 TEST PERIPHERALS USED	11
2.4 RECORD OF CLIMATIC CONDITIONS.....	11
2.5 INSTRUMENT LIST	12
2.6 MEASUREMENT UNCERTAINTY.....	14
EMISSION TEST	15
3. ASSESSMENT OF WIRED NETWORK PORTS	15
3.1 LIMITS.....	15
3.1.1 <i>Disturbance voltage limits at the electric power supply interface</i>	15
3.1.2 <i>Disturbance voltage limits at wired network interfaces other than power supply</i>	15
3.1.3 <i>Disturbance current limits at wired network interfaces other than power supply</i>	16
3.2 BLOCK DIAGRAM OF TEST SETUP	17
3.3 TEST SETUP AND TEST PROCEDURE	18
3.4 TEST PROTOCOL	19
4. ASSESSMENT OF LOCAL WIRED PORTS	22
4.1 LIMITS.....	22
4.1.1 <i>Disturbance voltage limits of local wired ports: electrical power supply interface of non-restricted ELV lamps</i>	22
4.1.2 <i>Disturbance voltage limits at local wired ports: local wired ports other than electrical power supply interface of ELV lamp</i>	22
4.1.3 <i>Disturbance current limits at local wired ports: local wired ports other than electrical power supply interface of ELV lamp</i>	23
4.2 BLOCK DIAGRAM OF TEST SETUP	24
4.3 TEST SETUP AND TEST PROCEDURE	25
4.4 TEST PROTOCOL	26
5. ASSESSMENT OF THE ENCLOSURE PORT (FREQUENCY RANGE 9 KHZ TO 30 MHZ).....	29
5.1 LIMITS.....	29
5.2 BLOCK DIAGRAM OF TEST SETUP	30
5.3 TEST PROTOCOL	31
6. ASSESSMENT OF THE ENCLOSURE PORT (FREQUENCY RANGE 30 MHZ TO 1GHZ)	34
6.1 LIMIT	34
6.2 BLOCK DIAGRAM AND TEST SET UP	35
6.3 TEST PROTOCOL	36
7. HARMONICS	38
7.1 BLOCK DIAGRAM OF TEST SETUP	38
7.2 TEST SETUP AND TEST PROCEDURE	38

7.3 TEST PROTOCOL	39
7.4 TEST RESULT.....	39
8. VOLTAGE FLUCTUATIONS-FLICKER.....	41
8.1 BLOCK DIAGRAM OF TEST SETUP.....	41
8.2 TEST SETUP AND TEST PROCEDURE	41
8.2.1 <i>Definition</i>	41
8.2.2 <i>Test condition</i>	41
8.3 TEST PROTOCOL.....	42
8.4 TEST RESULT.....	42
IMMUNITY TEST	43
9. ELECTROSTATIC DISCHARGE (ESD).....	44
9.1 SEVERITY LEVEL AND PERFORMANCE CRITERION.....	44
9.1.1 <i>Test level</i>	44
9.1.2 <i>Performance Criterion</i>	44
9.2 BLOCK DIAGRAM OF TEST SETUP	45
9.3 TEST SETUP AND TEST PROCEDURE	46
9.4 TEST PROTOCOL	47
10. ELECTROMAGNETIC FIELD SUSCEPTIBILITY	48
10.1 SEVERITY LEVEL AND PERFORMANCE CRITERION	48
10.1.1 <i>Test level</i>	48
10.1.2 <i>Performance Criterion</i>	48
10.2 BLOCK DIAGRAM OF TEST SETUP	49
10.3 TEST SETUP AND TEST PROCEDURE	49
10.4 TEST PROTOCOL	50
11. ELECTRIC FAST TRANSIENT/BURST IMMUNITY TEST	51
11.1 SEVERITY LEVEL AND PERFORMANCE CRITERION	51
11.1.1 <i>Test level</i>	51
11.1.2 <i>Performance Criterion</i>	51
11.2 BLOCK DIAGRAM OF TEST SETUP	52
11.2.1 <i>Block Diagram for input a.c./d.c. power line</i>	52
11.2.2 <i>Block Diagram for output a.c./d.c. power line or signal/control lines</i>	53
11.3 TEST SETUP AND TEST PROCEDURE	53
11.4 TEST PROTOCOL	54
12. SURGE IMMUNITY TEST	55
12.1 SEVERITY LEVEL AND PERFORMANCE CRITERION	55
12.1.1 <i>Test level</i>	55
12.1.2 <i>Performance Criterion</i>	55
12.2 BLOCK DIAGRAM OF TEST SETUP	56
12.3 TEST SETUP AND TEST PROCEDURE	56
12.4 TEST PROTOCOL	57
13. IMMUNITY TO CONDUCTED DISTURBANCES, INDUCED BY RADIO-FREQUENCY FIELDS	58
13.1 SEVERITY LEVEL AND PERFORMANCE CRITERION	58
13.1.1 <i>Test level</i>	58
13.1.2 <i>Performance Criterion</i>	58
13.2 BLOCK DIAGRAM OF TEST SETUP	58
13.3 TEST SETUP AND TEST PROCEDURE	59
13.4 TEST PROTOCOL	60
14. VOLTAGE DIPS, SHORT INTERRUPTIONS AND VOLTAGE VARIATIONS IMMUNITY TEST	61

14.1	SEVERITY LEVEL AND PERFORMANCE CRITERION	61
14.1.1	<i>Test level</i>	61
14.1.2	<i>Performance Criterion</i>	61
14.2	BLOCK DIAGRAM OF TEST SETUP	62
14.3	TEST SETUP AND TEST PROCEDURE	62
14.4	TEST PROTOCOL	62
APPENDIX I: PHOTOGRAPH OF EQUIPMENT UNDER TEST		63

Revision History

Report No.	Version	Description	Issued Date
230401083SHA-003	Rev. 01	Initial issue of report	April 17, 2023

Measurement result summary

TEST ITEM	TEST RESULT	NOTE
Assessment of wired network ports	Pass	
Assessment of local wired ports	NA	
Assessment of the enclosure port	Pass	
Harmonics	Pass	
Voltage fluctuation-Flicker	Pass	
Electrostatic Discharge (ESD)	Pass	
RF electromagnetic field susceptibility	Pass	
Electric Fast Transient /Burst (EFT/B)	Pass	
Surge	Pass	
Injected Current	Pass	
Voltage dips and interruption	Pass	

Notes: 1: NA =Not Applicable

2. Determination of the test conclusion is based on IEC Guide 115 in consideration of measurement uncertainty.
3. Additions, Deviations and Exclusions from Standards: None
- 4: All tests on the AC mains were performed on the peripheral adapter.

GENERAL INFORMATION

1.1 Description of Equipment Under Test (EUT)

Product name : LED Strip T1

Type/Model : LEDS-K01, LEDS-K02, RLS-K01D, RLS-K02D

Description of EUT : It is a product with Zigbee function, all models are identical except model name.

Model LEDS-K01 was selected to perform all tests.

Rating : DC 24V

Brand name : Aqara

Mains lead : Refer to the user's manual

Data cable : Refer to the user's manual

EUT type : Table-top
 Floor standing

Sample received date : November 25, 2022

Sample Identification : /
No.

Date of test : November 25, 2022 – March 31, 2023

1.2 Description of Test Facility

Name : Intertek Testing Services Shanghai

Address : Building 86, No. 1198 Qinzhou Road(North), Shanghai 200233, P.R. China

Telephone : 86 21 61278200

Telefax : 86 21 54262353

The test facility is recognized, certified, or accredited by these organizations

: CNAS Accreditation Lab
Registration No. CNAS L0139
FCC Accredited Lab
Designation Number: CN1175
IC Registration Lab
CAB identifier.: CN0051
VCCI Registration Lab
Registration No.: R-14243, G-10845, C-14723, T-12252
A2LA Accreditation Lab
Certificate Number: 3309.02

Subcontractor

Name : Fangguang Inspection & Testing Co., Ltd.

Address : Building 09,China Sensor Network International innovation Park,No.200,Linghu Avenue,Wuxi,Jiangsu,China

Telephone : 0510-68790033

Telefax : 0510-68790022

The test facility is recognized, certified, or accredited by these organizations

: CNAS Accreditation Lab
Registration No. CNAS L9092
FCC Accredited Lab
Designation Number: CN5037
NVLAP Lab CODE: 600222-0

1. TEST SPECIFICATIONS

2.1 Normative Standards

CISPR 15: Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment

IEC 61000-4-2: Electromagnetic Compatibility (EMC) – Part 4-2: testing and measurement techniques – electrostatic discharge immunity test

IEC 61000-4-3: Electromagnetic Compatibility (EMC) – Part 4-3: testing and measurement techniques – radiated, radio frequency, electromagnetic field immunity test

IEC 61000-4-4: Electromagnetic Compatibility (EMC) – Part 4-4: testing and measurement techniques – electric fast transient/burst immunity test

IEC 61000-4-5: Electromagnetic Compatibility (EMC) – Part 4-5: testing and measurement techniques – section 5: surge immunity test

IEC 61000-4-6: Electromagnetic Compatibility (EMC) – Part 4-6: testing and measurement techniques – section 6: immunity to conducted disturbance, induced by radio frequency field

IEC 61000-4-8: Electromagnetic compatibility (EMC) — Part 4-8: Testing and measurement techniques — Power frequency magnetic field immunity test.

IEC 61000-4-11: Electromagnetic Compatibility (EMC) – Part 4-11: testing and measurement techniques – voltage dips, short interruption and voltage variations immunity test

Note 1: there are no magnetic sensitive components included in this EUT and magnetic field immunity test according to EN 61000-4-8 is therefore not required.

Note 2: the latest version is applied for all standards above.

2.2 Mode of operation during the test

Within this test report, EUT was tested under all available operation modes and tested under its rating voltage and frequency. Other voltage and frequency is specified if used.

2.3 Test Peripherals used

Item No	Description	Manufacturer	Model	Note
1	INNBOXV60-U Router	INNBOX	SBB1177HO	/
2	Phone	VIVO	VIVO Y79	/
3	M1S gateway	Aqara	M1S	/
4	Extended light strip	Aqara	/	6m
5	Adapter	Shenzhen Cenwell technology Co., Ltd.	CW2401500RE	/

2.4 Record of climatic conditions

Test Item	Temperature (°C)	Relative Humidity (%)	Pressure (Kpa)
Assessment of wired network ports	22	53	NA
Assessment of local wired ports	NA	NA	NA
Assessment of the enclosure port (Radio frequency magnetic field emission)	22	53	NA
Assessment of the enclosure port (Radiated Emission)	22	53	NA
Harmonics	22	53	NA
Voltage fluctuation-Flicker	22	53	NA
Electrostatic Discharge (ESD)	22	53	101
RF electromagnetic field susceptibility	22	53	NA
Electric Fast Transient /Burst (EFT/B)	22	53	NA
Surge	22	53	NA
Injected Current	22	53	NA
Voltage dips and interruption	22	53	NA

Notes: NA =Not Applicable

2.5 Instrument list

Conducted Emission/Disturbance Power/Tri-loop Test/CDN method					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input checked="" type="checkbox"/>	EMI Receiver	Rohde & Schwarz	ESR3	FWXGJC-2016-181	2023-04-26
<input checked="" type="checkbox"/>	L.I.S.N	Rohde & Schwarz	ENV216	FWXGJC-2016-182	2023-06-01
<input checked="" type="checkbox"/>	Triple Loop Antenna	Rohde & Schwarz	HXYZ 9170	FWXGJC-2016-195	2023-04-13
Radiated Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input checked="" type="checkbox"/>	Bi-Log Antenna	Rohde & Schwarz	HL562E	FWXGJC-2016-267-06	2023-03-30
<input checked="" type="checkbox"/>	EMI Receiver	Rohde & Schwarz	ESR26	FWXGJC-2016-267-01	2023-11-08
<input checked="" type="checkbox"/>	Semi anechoic chamber	EMC	EMCCT-3	FWXGJC-2016-270	2023-04-07
Harmonics/Flicker/Low-frequency immunity test					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input checked="" type="checkbox"/>	Harmonic analyzer	Ametek	100-CTS-230	FWXGJC-2016-176	2023-05-15
<input checked="" type="checkbox"/>	Harmonic power supply	Ametek	5001ix-400-411-413	FWXGJC-2016-177	2023-12-26
ESD					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input checked="" type="checkbox"/>	ESD TESTER	3ctest	EDS 30T	FWXGDB-2016-129	2023-11-18
EFT/Surge/Voltage Dips					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input checked="" type="checkbox"/>	EFT Generator	3ctest	EFT 500T	FWXGDA-2016-130	2024-01-29
<input checked="" type="checkbox"/>	Surge Generator	3ctest	CWS 600G	FWXGDA-2016-141	2024-03-05
<input checked="" type="checkbox"/>	CDN	3ctest	SPN3832T	FWXGDA-2016-142	2024-03-05
Conducted Immunity					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input checked="" type="checkbox"/>	Signal Generator	TESEQ	NSG 4070-35	FWXGJC-2016-188	2024-01-15
<input checked="" type="checkbox"/>	Attenuator	TESEQ	ATN 6050	FWXGJC-2016-193	2023-12-15
<input checked="" type="checkbox"/>	CDN	TESEQ	CDN M016	FWXGJC-2016-189	2023-11-20

Radiated Immunity					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input checked="" type="checkbox"/>	Signal Generator	Keysight	N5171B-506	FWXGJC-2016-269-05	2023-11-02
<input checked="" type="checkbox"/>	double-Logarithmic antenna	Frankonia	AXL-80	FWXGJC-2016-269-03	2024-03-10
<input checked="" type="checkbox"/>	Rf power probe	Agilent	U2001A	FGZZ-2020-004 FGZZ-2020-005	2024-03-05
<input checked="" type="checkbox"/>	Amplifier	Frankonia	VLH-200B1	FWXGJC-2016-269-02	2023-11-24
<input checked="" type="checkbox"/>	Semi anechoic chamber	EMC	EMCCT-3	FWXGJC-2016-270	2023-04-07
<input checked="" type="checkbox"/>	RF switch	Frankonia	RSU-4203	FWXGJC-2016-269-08	/
Additional instrument					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input checked="" type="checkbox"/>	30KVA power supply	apc	AFC-33030T	FWXGJC-2016-293	2023-12-20
<input checked="" type="checkbox"/>	Hygrothermograph	Mittel	HTC-1	FWXDA-2016-387	2023-11-21
<input checked="" type="checkbox"/>	Aneroid Barometer	Shanghai Yipin	DYM3	FWXDA-2018-038	2023-12-01

2.6 Measurement Uncertainty

Item No.	Test Items			Expanded Uncertainty (k=2)
1	Conducted Emission			2.05
2	Humidity			6 %
3	Temperature			2°C
4	Radiated Emission	Horizontal	30MHz~1000MHz	4.3dB
5			1GHz~12.75GHz	5.6dB
6		Vertical	30MHz~1000MHz	4.3dB
7			1GHz~12.75GHz	5.6dB
8	Radiated Disturbance (Tri-Loop)			1.88dB

Emission Test

2. Assessment of wired network ports

Test result: **PASS**

3.1 Limits

3.1.1 Disturbance voltage limits at the electric power supply interface

Frequency range (MHz)	Limits dB(µV) ¹	
	Quasi-peak	Average
0.009 ~ 0.05	110	-
0.05 ~ 0.15	90 ~ 80 ²	-
0.15 ~ 0.5	66 ~ 56 ²	56 ~ 46 ²
0.5 ~ 5.0	56 ³	46 ³
5.0 ~ 30	60	50

Notes:

- At the transition frequency, the lower limit applies.
- The limit decreases linearly with the logarithm of the frequency in the ranges 50 kHz to 150 kHz and 150 kHz to 0,5 MHz.
- For lighting equipment incorporating exclusively electrodeless lamps, the limit in the frequency range of 2,2 MHz to 3,0 MHz is 73 dB(µV) quasi-peak and 63 dB(µV) average.
- If the limit for the measurement with the average detector is met when using a receiver with a quasi-peak detector, the equipment under test shall be deemed to meet both limits and the measurement using the receiver with an average detector need not be carried out.

3.1.2 Disturbance voltage limits at wired network interfaces other than power supply

Frequency range (MHz)	Limits dB(µV)	
	Quasi-peak	Average
0.15 ~ 0.5	80 to 74	70 to 64
0.5 ~ 30	74	64

Note:

- The limits decrease linearly with the logarithm of the frequency in the range 0,15 MHz to 0,5 MHz.
- The disturbance voltage limits are derived for use with an artificial asymmetrical network (AAN) which presents a common mode (asymmetric mode) impedance of 150 Ω to the measured interface.
- If the limit for the measurement with the average detector is met when using a receiver with a quasi-peak detector, the equipment under test shall be deemed to meet both limits and the measurement using the receiver with an average detector need not be carried out.

3.1.3 Disturbance current limits at wired network interfaces other than power supply

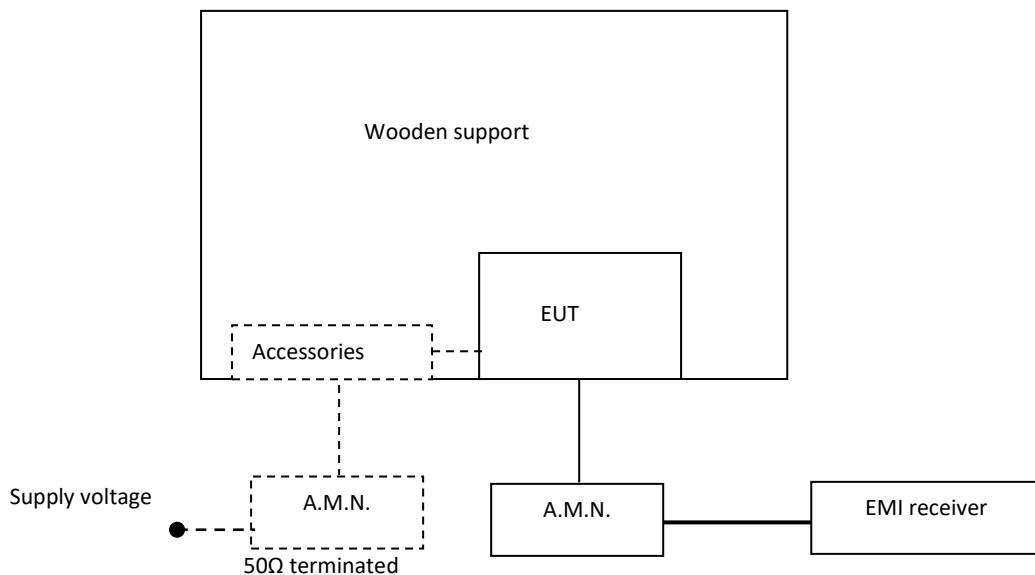
Frequency range (MHz)	Limits dB(μ V)	
	Quasi-peak	Average
0.15 ~ 0.5	40 to 30	30 to 20
0.5 ~ 30	30	20

Note:

1. The limits decrease linearly with the logarithm of the frequency in the range 0,15 MHz to 0,5 MHz.
2. The disturbance current limits are derived for use of a common mode (asymmetric mode) impedance of 150Ω . Hence the conversion factor applied is $20 \log(150) = 44 \text{ dB}\Omega$.
3. If the limit for the measurement with the average detector is met when using a receiver with a quasi-peak detector, the equipment under test shall be deemed to meet both limits and the measurement using the receiver with an average detector need not be carried out.

3.2 Block Diagram of Test Setup

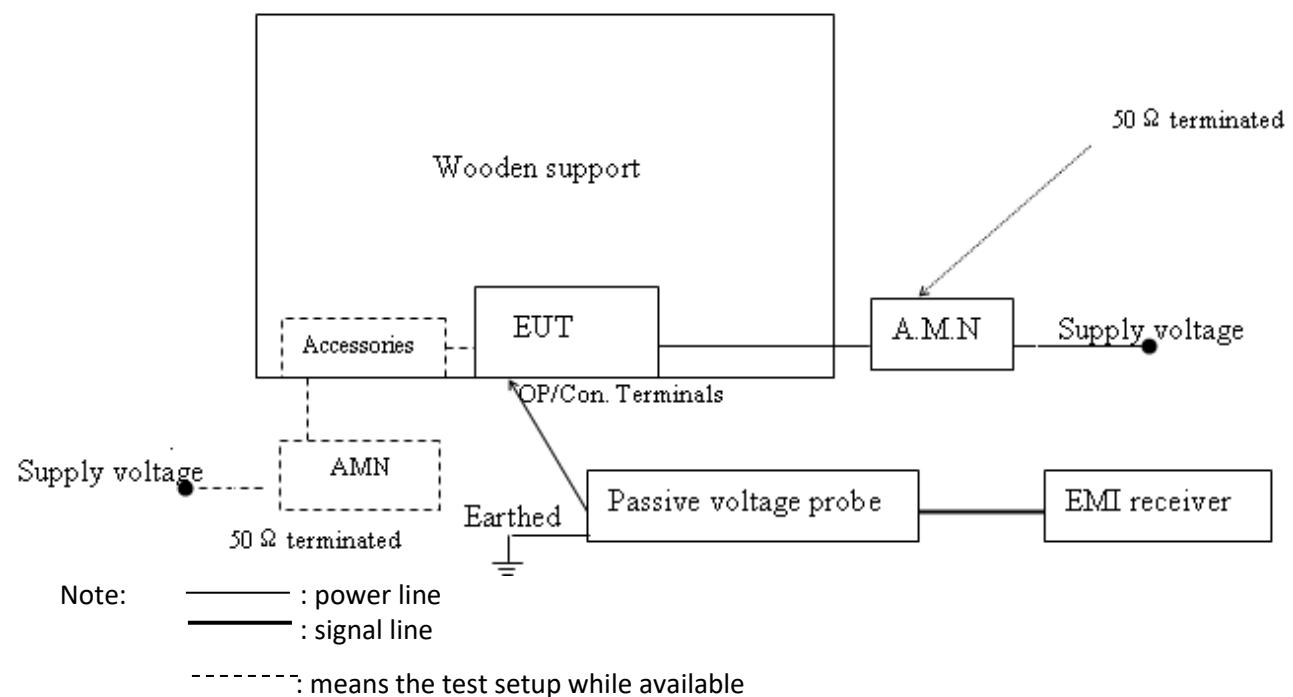
- At electric power supply interface



- For table top equipment, wooden support is 0.8m height table

- For floor standing equipment, wooden support is 0.1m height rack.

- At wired network interfaces other than power supply



3.3 Test Setup and Test Procedure

Detailed test procedure and arrangement was following EN IEC 55015 clause 8 & Annex B.

Operation conditions of EUT were according to EN IEC 55015 clause 7 & Annex A.

Measurement was carried out with lamps which have been in operation for:

2 h for incandescent technologies;

100 h for discharge technologies.

Prior to a measurement, the lamps were operated until stabilization has been reached, and the following stabilization time was observed:

15 min for EUTs that do not include gas discharge technologies;

30 min for EUTs that include gas discharge technologies.

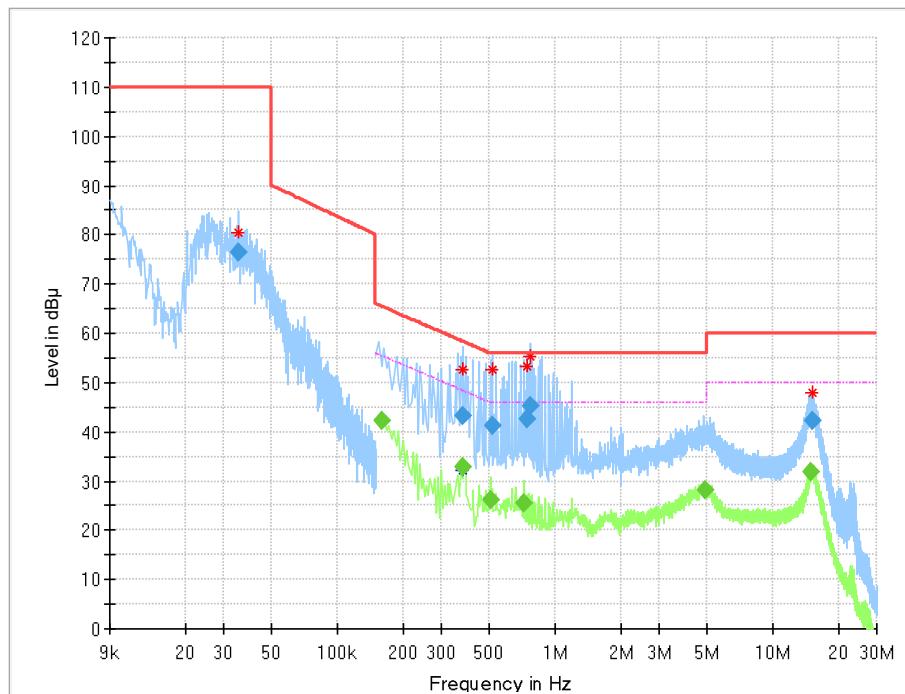
The frequency from 9kHz to 30MHz was checked.

The bandwidth of test receiver was set on 200Hz (from 9kHz to 150kHz) and 9kHz (from 150kHz to 30MHz).

3.4 Test Protocol

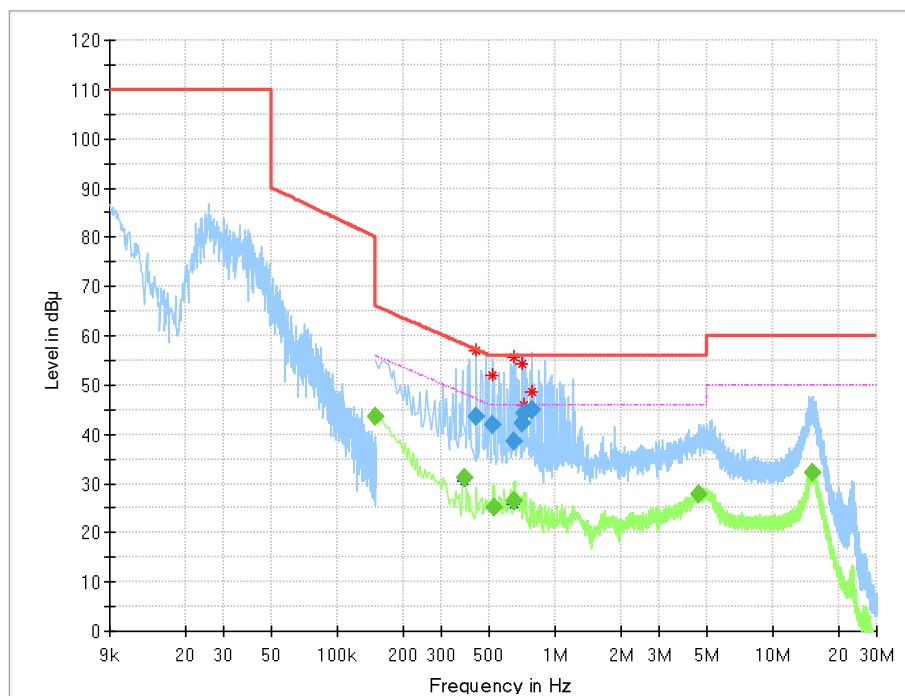
For electric power supply interface: Pass

L-Line



Frequency (MHz)	QuasiPeak (dBuV)	Average (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.035200	76.31	---	110.00	33.69	1000.0	0.200	L1	OFF	9.8
0.159000	---	42.22	55.52	13.29	100.0	9.000	L1	OFF	9.6
0.379500	---	32.71	48.29	15.58	100.0	9.000	L1	OFF	9.6
0.379500	43.07	---	58.29	15.22	100.0	9.000	L1	OFF	9.6
0.505500	---	26.25	46.00	19.75	100.0	9.000	L1	OFF	9.6
0.514500	41.36	---	56.00	14.64	100.0	9.000	L1	OFF	9.6
0.721500	---	25.59	46.00	20.41	100.0	9.000	L1	OFF	9.6
0.744000	42.45	---	56.00	13.55	100.0	9.000	L1	OFF	9.6
0.775500	45.32	---	56.00	10.68	100.0	9.000	L1	OFF	9.6
4.852500	---	28.31	46.00	17.69	100.0	9.000	L1	OFF	9.7
15.031500	---	31.89	50.00	18.11	100.0	9.000	L1	OFF	9.8
15.094500	42.11	---	60.00	17.89	100.0	9.000	L1	OFF	9.8

N-Line



Frequency (MHz)	QuasiPeak (dB μ V)	Average (dB μ V)	Limit (dB μ V)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.150000	---	43.62	56.00	12.38	100.0	9.000	N	OFF	9.6
0.384000	---	31.30	48.19	16.90	100.0	9.000	N	OFF	9.6
0.433500	43.53	---	57.19	13.66	100.0	9.000	N	OFF	9.6
0.519000	42.01	---	56.00	13.99	100.0	9.000	N	OFF	9.6
0.528000	---	25.26	46.00	20.74	100.0	9.000	N	OFF	9.6
0.645000	38.56	---	56.00	17.44	100.0	9.000	N	OFF	9.6
0.645000	---	26.58	46.00	19.42	100.0	9.000	N	OFF	9.6
0.703500	42.19	---	56.00	13.81	100.0	9.000	N	OFF	9.6
0.712500	44.19	---	56.00	11.81	100.0	9.000	N	OFF	9.6
0.780000	45.01	---	56.00	10.99	100.0	9.000	N	OFF	9.6
4.551000	---	27.88	46.00	18.12	100.0	9.000	N	OFF	9.7
15.229500	---	32.03	50.00	17.97	100.0	9.000	N	OFF	9.8

For wired network interfaces other than power supply: NA

- Disturbance voltage
 - Disturbance current

Remark: 1. Correct Factor = LISN Factor + Cable Loss, the value was added to Original Receiver Reading by the software automatically.
2. Corrected Reading = Original Receiver Reading + Correct Factor
3. Margin = Limit - Corrected Reading
4. If the PK Corrected Reading is lower than AV limit, the AV test can be elided.

Example: Assuming LISN Factor = 10.00dB, Cable Loss = 2.00dB,
Original Receiver Reading = 10.00dBuV, Limit = 66.00dBuV.
Then Correct Factor = 10.00 + 2.00 = 12.00dB;
Corrected Reading = 10dBuV + 12.00dB = 22.00dBuV;
Margin = 66.00dBuV - 22.00dBuV = 44.00dB.

3. Assessment of local wired ports

Test result: NA

4.1 Limits

4.1.1 Disturbance voltage limits of local wired ports: electrical power supply interface of non-restricted ELV lamps

Frequency range (MHz)	Limits dB(μ V) ¹³⁴	
	Quasi-peak	Average
0.009 ~ 0.05	136	-
0.05 ~ 0.15	116 ~ 106 ²	-
0.15 ~ 0.5	92 ~ 82 ²	82 ~ 72 ²
0.5 ~ 5.0	82	72
5.0 ~ 30	86	76

Notes:

1. At the transition frequency, the lower limit applies.
2. The limit decreases linearly with the logarithm of the frequency in the ranges 50 kHz to 150 kHz and 150 kHz to 0,5 MHz.
3. The limits in this table apply if no 26 dB attenuator is applied.
4. Disturbance voltage limits for restricted ELV lamps are given in 3.1.1.
5. If the limit for the measurement with the average detector is met when using a receiver with a quasi-peak detector, the equipment under test shall be deemed to meet both limits and the measurement using the receiver with an average detector need not be carried out.

4.1.2 Disturbance voltage limits at local wired ports: local wired ports other than electrical power supply interface of ELV lamp

Frequency range (MHz)	Limits dB(μ V)	
	Quasi-peak	Average
0.15 ~ 0.5	80	70
0.5 ~ 30	74	64

Note:

1. At the transition frequency, the lower limit applies.
2. If the limit for the measurement with the average detector is met when using a receiver with a quasi-peak detector, the equipment under test shall be deemed to meet both limits and the measurement using the receiver with an average detector need not be carried out.

4.1.3 Disturbance current limits at local wired ports: local wired ports other than electrical power supply interface of ELV lamp

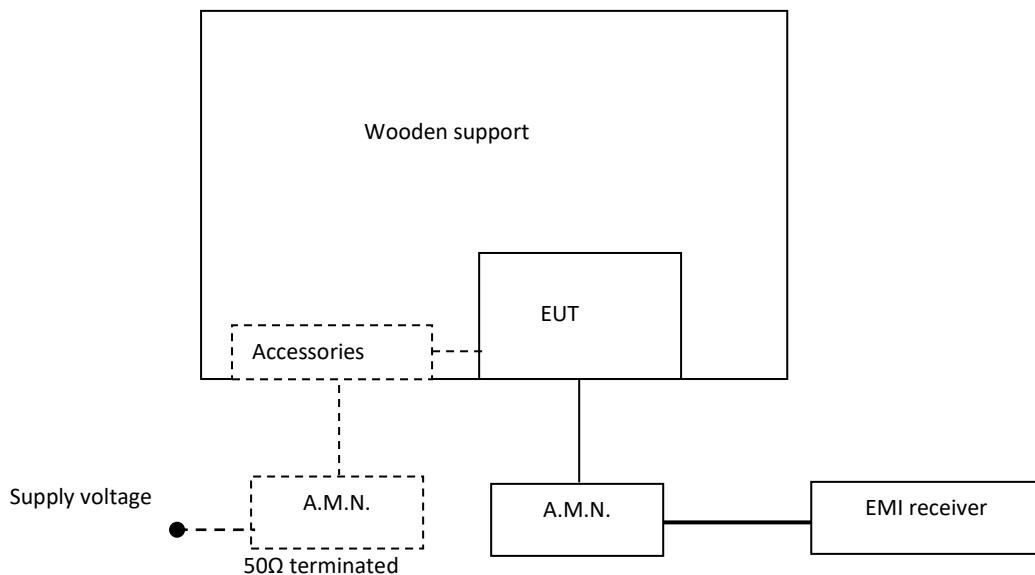
Frequency range (MHz)	Limits dB(µV)	
	Quasi-peak	Average
0.15 ~ 0.5	40 to 30	30 to 20
0.5 ~ 30	30	20

Note:

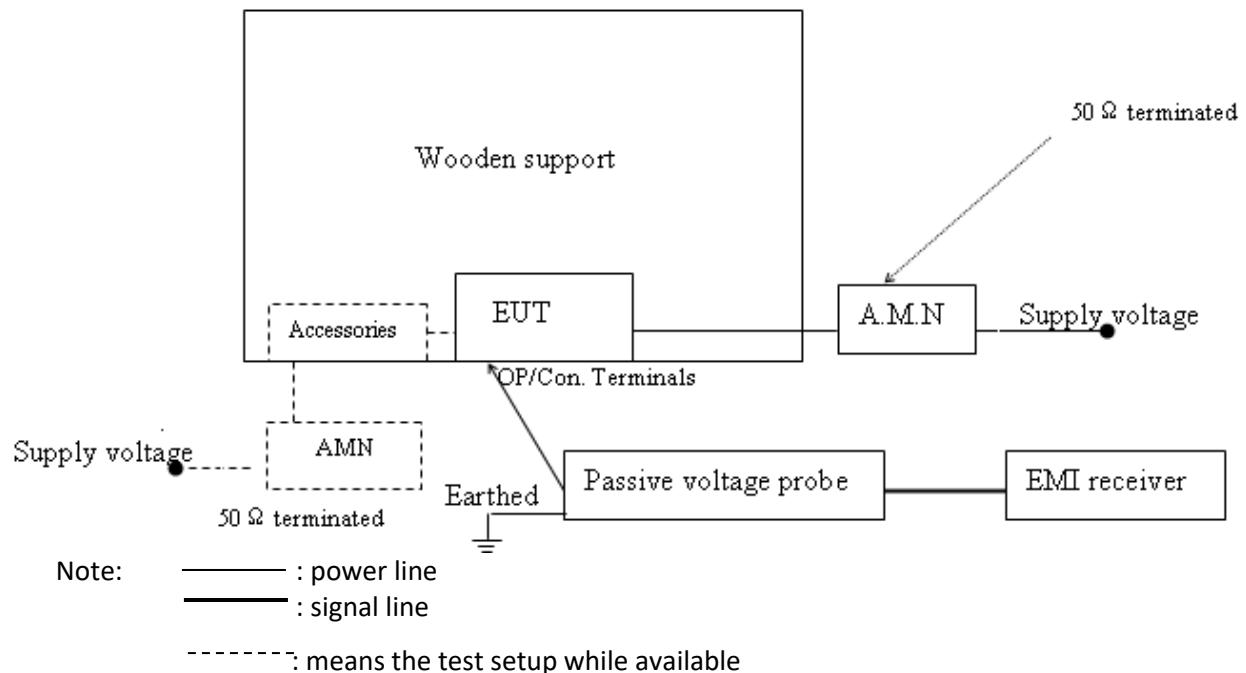
- 1. The limits decrease linearly with the logarithm of the frequency in the range 0,15 MHz to 0,5 MHz.
- 2. The disturbance current limits are derived for use of a common mode (asymmetric mode) impedance of 150Ω . Hence the conversion factor applied is $20 \log(150) = 44 \text{ dB}\Omega$.
- 3. If the limit for the measurement with the average detector is met when using a receiver with a quasi-peak detector, the equipment under test shall be deemed to meet both limits and the measurement using the receiver with an average detector need not be carried out.

4.2 Block Diagram of Test Setup

- At electric power supply interface of non-restricted ELV lamps



- For table top equipment, wooden support is 0.8m height table
 For floor standing equipment, wooden support is 0.1m height rack.
 At wired network interfaces other than electrical power supply of ELV lamp



4.3 Test Setup and Test Procedure

Detailed test procedure and arrangement was following EN IEC 55015 clause 8 & Annex B.

Operation conditions of EUT were according to EN IEC 55015 clause 7 & Annex A.

Measurement was carried out with lamps which have been in operation for:

2 h for incandescent technologies;

100 h for discharge technologies.

Prior to a measurement, the lamps were operated until stabilization has been reached, and the following stabilization time was observed:

15 min for EUTs that do not include gas discharge technologies;

30 min for EUTs that include gas discharge technologies.

The frequency from 9kHz to 30MHz was checked.

The bandwidth of test receiver was set on 200Hz (from 9kHz to 150kHz) and 9kHz (from 150kHz to 30MHz).

4.4 Test Protocol

For electrical power supply interface of non-restricted ELV lamps: NA

L-Line

Frequency (MHz)	Quasi-peak			Average		
	Corrected Reading (dBuV)	Limit (dBuV)	Margin (dB)	Corrected Reading (dBuV)	Limit (dBuV)	Margin (dB)
Note: * means the emission level 20dB below the relevant limit.						

N-Line

Remark: 1. Correct Factor = LISN Factor + Cable Loss, the value was added to Original Receiver Reading by the software automatically.
2. Corrected Reading = Original Receiver Reading + Correct Factor
3. Margin = Limit - Corrected Reading
4. If the PK Corrected Reading is lower than AV limit, the AV test can be elided.

Example: Assuming LISN Factor = 10.00dB, Cable Loss = 2.00dB,
Original Receiver Reading = 10.00dBuV, Limit = 66.00dBuV.
Then Correct Factor = 10.00 + 2.00 = 12.00dB;
Corrected Reading = 10dBuV + 12.00dB = 22.00dBuV;
Margin = 66.00dBuV – 22.00dBuV = 44.00dB.

For local wired ports other than electrical power supply interface of ELV lamp: NA

- Disturbance voltage
 - Disturbance current

Remark: 1. Correct Factor = LISN Factor + Cable Loss, the value was added to Original Receiver Reading by the software automatically.
2. Corrected Reading = Original Receiver Reading + Correct Factor
3. Margin = Limit - Corrected Reading
4. If the PK Corrected Reading is lower than AV limit, the AV test can be elided.

Example: Assuming LISN Factor = 10.00dB, Cable Loss = 2.00dB,
Original Receiver Reading = 10.00dBuV, Limit = 66.00dBuV.
Then Correct Factor = $10.00 + 2.00 = 12.00$ dB;
Corrected Reading = $10\text{dBuV} + 12.00\text{dB} = 22.00\text{dBuV}$;
Margin = $66.00\text{dBuV} - 22.00\text{dBuV} = 44.00\text{dB}$.

4. Assessment of the enclosure port (Frequency range 9 kHz to 30 MHz)

Test result: **PASS**

5.1 Limits

LLAS radiated disturbance limits in the frequency range 9 kHz to 30 MHz

Frequency Range	Quasi-peak limits for three loop diameters dB(μA)		
	2m	3m	4m
9kHz ~ 70kHz	88	81	75
70kHz ~ 150kHz	88 ~ 58 ¹	81 ~ 51 ¹	75 ~ 45 ¹
150kHz ~ 3.0MHz	58 ~ 22 ¹²	51 ~ 15 ¹²	45 ~ 9 ¹²
3.0MHz ~ 30MHz	22	15 ~ 16 ³	9 ~ 12 ³

Notes:

1. Decreasing linearly with the logarithm of the frequency.
2. For lighting equipment incorporating exclusively electrodeless lamps, the limit in the frequency range of 2,2 MHz to 3,0 MHz is 58 dB(μA) for 2 m, 51 dB(μA) for 3 m and 45 dB(μA) for 4 m loop diameter.
3. Increasing linearly with the logarithm of the frequency.

Maximum EUT dimension that can be used for testing using LLAS with different diameters

Maximum dimension of the EUT, D m	Loop antenna diameter m
D ≤ 1,6	2
D ≤ 2,6	3
D ≤ 3,6	4

Loop antenna radiated disturbance limits in the frequency range 9 kHz to 30 MHz for equipment with a dimension > 1,6 m

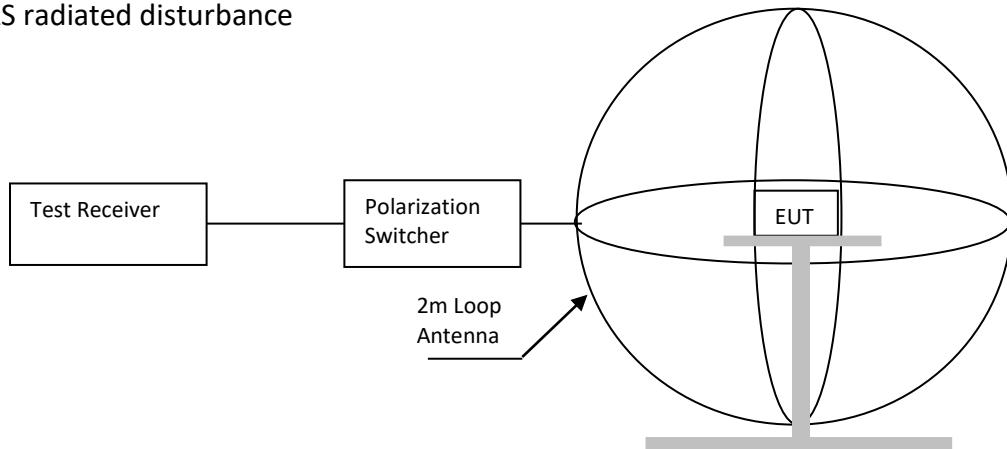
Frequency range MHz	Limits at 3 m distance Quasi-peak dB(μA/m)
0,009 to 0,070	69
0,070 to 0,150	69 to 39 ²
0,150 to 4,0	39 to 3 ¹²
4,0 to 30	3

Notes:

1. For lighting equipment incorporating exclusively electrodeless lamps, the limit in the frequency range of 2,2 MHz to 3,0 MHz is 39 dB(μA/m).
2. Decreasing linearly with logarithm of frequency.

5.2 Block Diagram of Test Setup

LLAS radiated disturbance

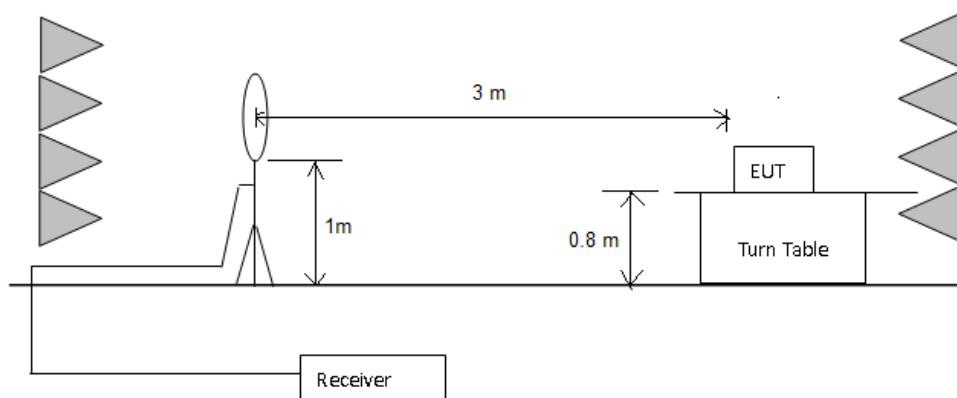


Measurement was performed in shielded room, and instruments used were following EN IEC 55015 clause 9.

Detailed test procedure and arrangement was following EN IEC 55015 clause 9 & Annex C.

Frequency range 9kHz – 30MHz was checked and EMI receiver measurement bandwidth was set to 200Hz (from 9kHz to 150kHz) and 9kHz (from 150kHz to 30MHz).

Loop antenna radiated disturbance



The measurement was applied in a semi-anechoic chamber.

Measurement was performed according to CISPR 32 Annex C.

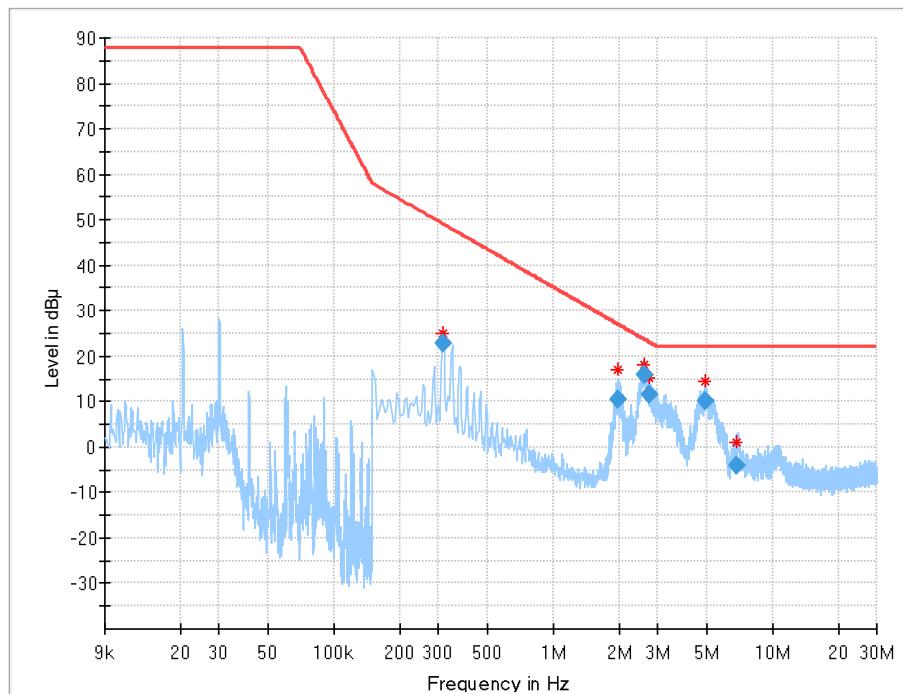
Setting of EUT is according to EN IEC 55015 clause 9 & Annex C.

Frequency range 9kHz – 30MHz was checked and EMI receiver measurement bandwidth was set to 200Hz (from 9kHz to 150kHz) and 9kHz (from 150kHz to 30MHz).

5.3 Test Protocol

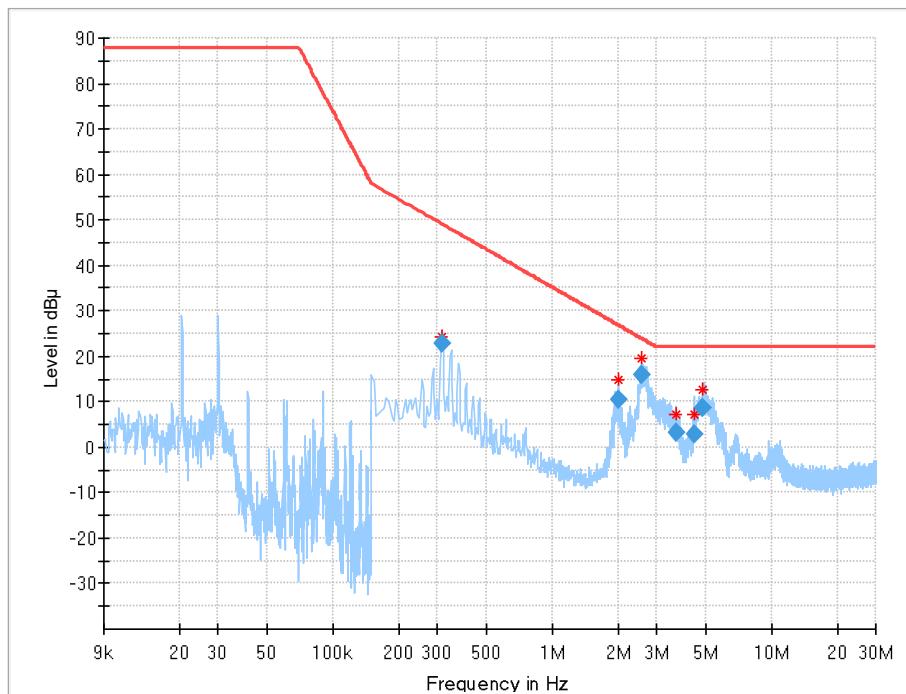
- LLAS radiated disturbance (EN IEC 55015 clause 9.3.2)
- Loop antenna radiated disturbance (EN IEC 55015 clause 9.3.3)

X direction:



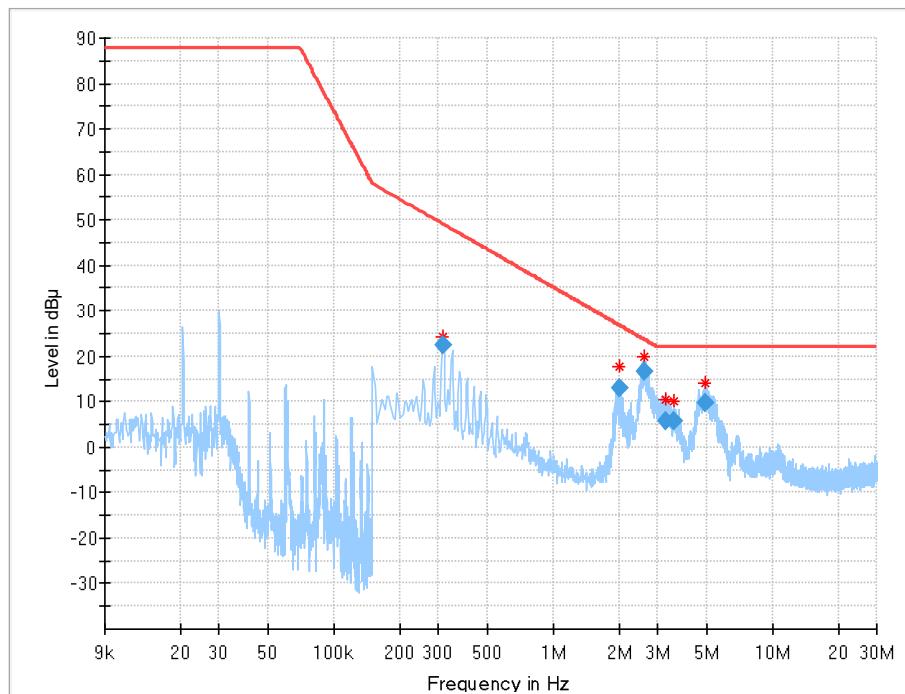
Frequency (MHz)	QuasiPeak (dBuA)	Limit (dBuA)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Axis
0.314000	22.78	49.12	26.35	1000.0	9.000	X
1.986000	10.61	26.96	16.35	1000.0	9.000	X
2.602000	15.86	23.71	7.85	1000.0	9.000	X
2.738000	11.67	23.10	11.43	1000.0	9.000	X
4.978000	9.93	22.00	12.07	1000.0	9.000	X
6.870000	-4.00	22.00	26.00	1000.0	9.000	X

Y direction:



Frequency (MHz)	QuasiPeak (dB μ A)	Limit (dB μ A)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Axis
0.314000	22.66	49.12	26.47	1000.0	9.000	Y
2.014000	10.37	26.79	16.42	1000.0	9.000	Y
2.570000	15.81	23.86	8.05	1000.0	9.000	Y
3.654000	3.29	22.00	18.71	1000.0	9.000	Y
4.482000	2.99	22.00	19.01	1000.0	9.000	Y
4.902000	8.52	22.00	13.48	1000.0	9.000	Y

Z direction:



Frequency (MHz)	QuasiPeak (dBuA)	Limit (dBuA)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Axis
0.314000	22.61	49.12	26.52	1000.0	9.000	Z
2.014000	13.05	26.79	13.74	1000.0	9.000	Z
2.586000	16.72	23.79	7.07	1000.0	9.000	Z
3.266000	5.78	22.00	16.22	1000.0	9.000	Z
3.534000	5.92	22.00	16.08	1000.0	9.000	Z
4.950000	9.67	22.00	12.33	1000.0	9.000	Z

5. Assessment of the enclosure port (Frequency range 30 MHz to 1GHz)

Test result: **PASS**

6.1 Limit

SAC method limits from frequency range 30MHz – 1000MHz

Frequency (MHz)	Permitted limit in dB μ V/m (Quasi-peak) of Measurement Distance 3m	Permitted limit in dB μ V/m (Quasi-peak) of Measurement Distance 10m
30 ~ 230	40	30
230 ~ 1000	47	37

Notes:

1. At the transition frequency, the lower limit applies.
2. The gray rows are selected items.

CDNE method limits 30MHz – 300MHz

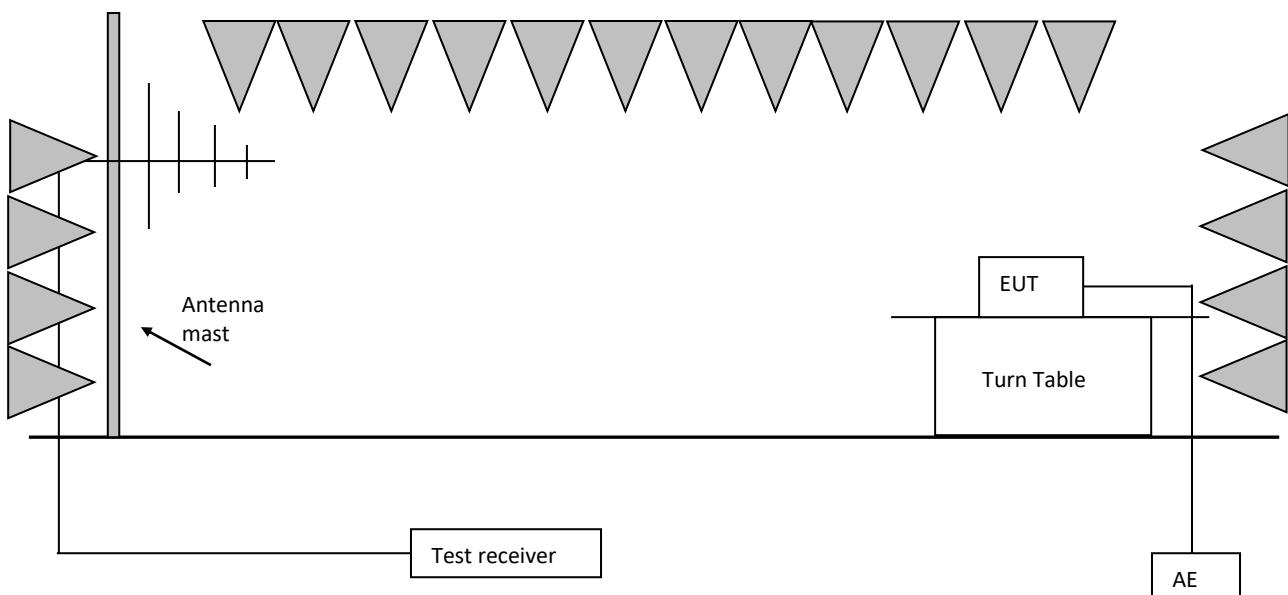
Frequency (MHz)	Quasi-peak limits dB(μ V)
30 ~ 100	64 ~ 45 ²
100 ~ 200	54
200 ~ 300	54 to 51 ²

Notes:

1. At the transition frequency, the lower limit applies.
2. The limit decreases linearly with the logarithm of the frequency.
3. The CDNE method and the associated limits up to 300 MHz can be only applied for EUTs with clock frequencies below or equal to 30 MHz. In such a case, the product is deemed to comply with the requirements between 300 MHz and 1 000 MHz. If the CDNE test fails, then any of the other methods and associated limits can still be applied.
4. The EUT size limitation of CISPR 16-2-1 does not apply. For the CDNE method, the largest dimensions of the EUT are 3 m x 1 m x 1 m (l x w x h). The CDNE restrictions apply to the EUT only, and not the wiring or the total dimension of the system under test.

6.2 Block diagram and test set up

For SAC method



The measurement was applied in a semi-anechoic chamber.

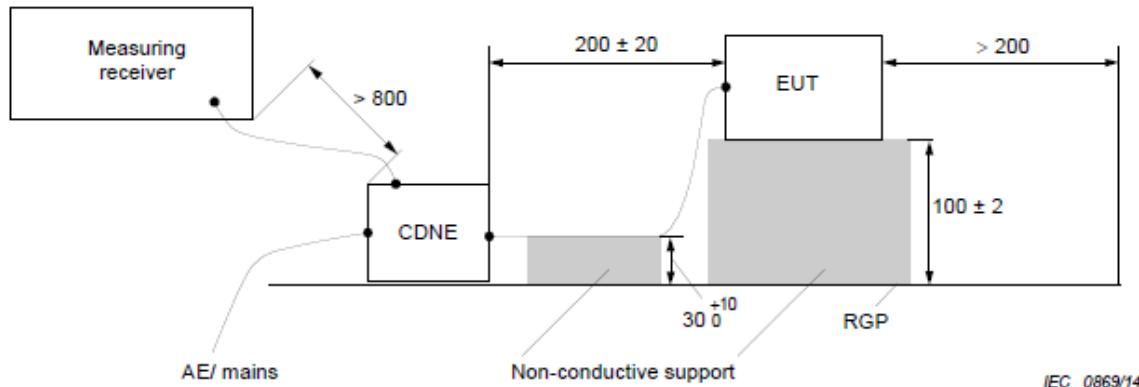
Measurement was performed according to CISPR 32 Annex C.

Setting of EUT is according to EN IEC 55015 clause 9 & Annex C.

The bandwidth setting on test receiver was 120kHz.

The frequency range from 30MHz to 1000MHz was checked.

For CDNE method



"AE/mains" may include AC mains, DC supply as well as control/communication lines.

NOTE All dimensions are in mm.

Measurement and setting of EUT were performed according to EN IEC 55015 clause 9 & Annex C.
The frequency range from 30MHz to 300MHz was checked.

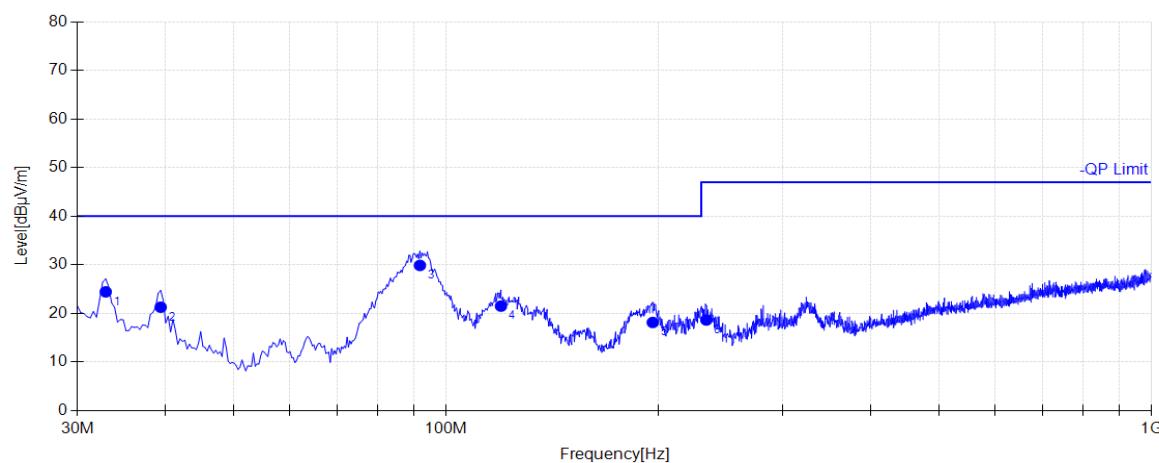
6.3 Test Protocol

Test is performed while employing:

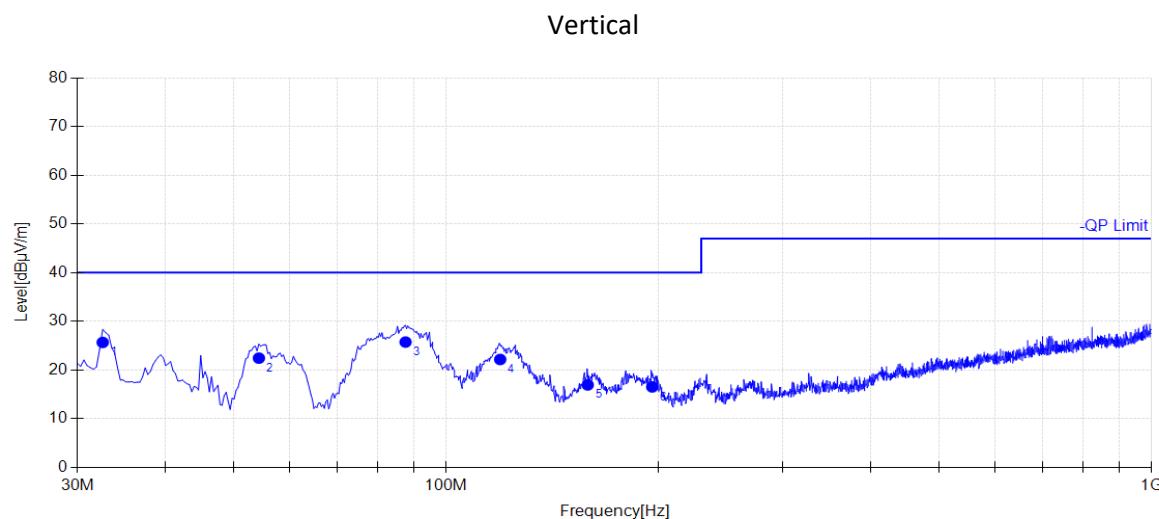
- SAC method (EN IEC 55015 clause 9.3.4.1)
- CDNE method (EN IEC 55015 clause 9.3.4.4)

Test Curve:

Horizontal



Final Data List								
NO.	Freq. [MHz]	Factor [dB]	QP Value [dB μ V/m]	QP Limit [dB μ V/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity
1	32.9110	18.24	24.44	40.00	15.56	200	79	Horizontal
2	39.3798	14.95	21.28	40.00	18.72	100	302	Horizontal
3	91.7773	10.20	29.88	40.00	10.12	200	266	Horizontal
4	119.5932	11.64	21.51	40.00	18.49	200	86	Horizontal
5	196.2488	9.90	18.14	40.00	21.86	100	212	Horizontal
6	233.7679	10.96	18.65	47.00	28.35	100	232	Horizontal

Test Curve:


Final Data List								
NO.	Freq. [MHz]	Factor [dB]	QP Value [dB μ V/m]	QP Limit [dB μ V/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity
1	32.5875	18.40	25.67	40.00	14.33	100	218	Vertical
2	54.2581	8.36	22.45	40.00	17.55	100	72	Vertical
3	87.5725	9.92	25.75	40.00	14.25	100	17	Vertical
4	119.2698	11.64	22.17	40.00	17.83	100	120	Vertical
5	158.7296	10.40	16.94	40.00	23.06	100	128	Vertical
6	195.9253	9.91	16.54	40.00	23.46	200	31	Vertical

6. Harmonics

Test result: **PASS**

7.1 Block Diagram of Test Setup



7.2 Test Setup and Test Procedure

Harmonics of the fundamental current were measured up to 40 order harmonics using a digital power meter with an analogue output and frequency analyser which was integrated in the harmonic & flicker test system. The measurements were carried out under steady conditions.

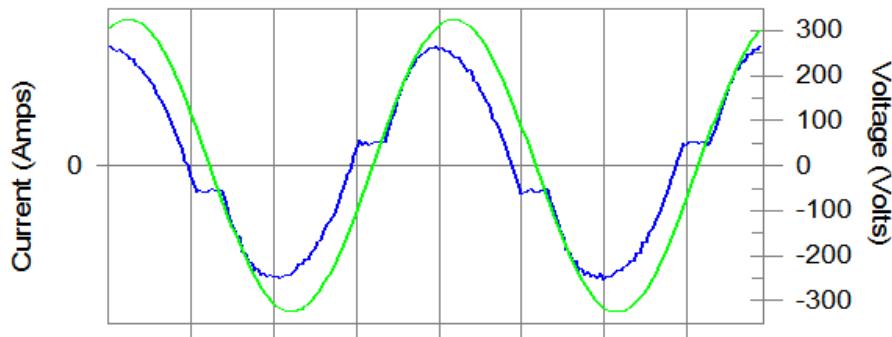
7.3 Test Protocol

- The EUT is lighting equipment with a rated power less than but not equal to 5 W. Therefore, no limits are defined according to EN IEC 61000-3-2 on the EUT.
- Rated power \geq 5 W and \leq 25 W
- Rated power $>$ 25 W

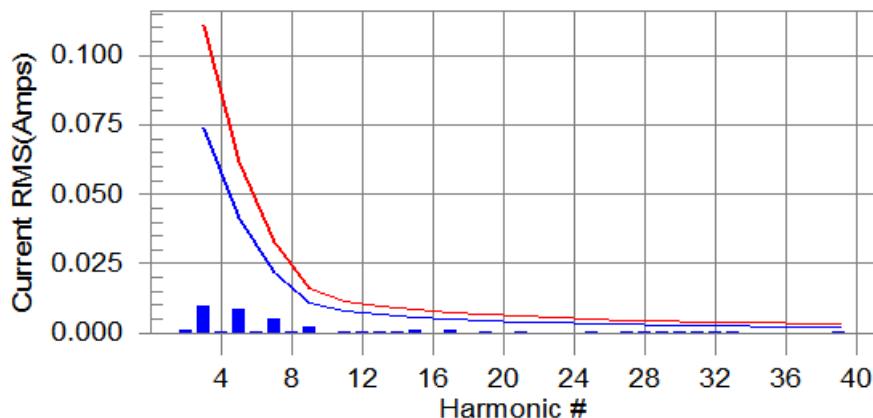
7.4 Test Result

Test Result: Pass Source qualification: Normal

Current & voltage waveforms



Harmonics and Class C limit line (Table 3, column 2 limits) European Limits



Test result: Pass Worst harmonics H5-14.0% of 150% limit, H5-20.2% of 100% limit

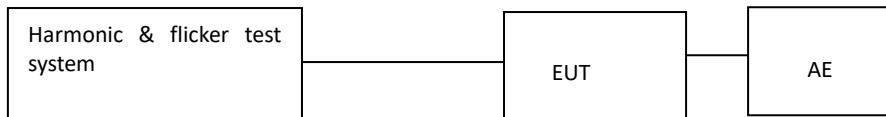
Test category: Class-C (European limits)
Test Result: Pass Source qualification: Normal
THC(A): 0.014 I-THD(%): 14.0 POHC(A): 0.001 POHC Limit(A): 0.009
Highest parameter values during test:
V_RMS (Volts): 230.06 Frequency(Hz):
I_Peak (Amps): 0.157 I_RMS (Amps): 0.099
I_Fund (Amps): 0.098 Crest Factor: 1.588
Power (Watts): 21.7 Power Factor: 0.951

Harm#	Harms(avg)	100%Limit	%of Limit	Harms(max)	150%Limit	%of Limit	Status
2	0.001	0.000	N/A	0.001	0.000	N/A	Pass
3	0.009	0.074	12.7	0.010	0.111	9.5	Pass
4	0.001	0.000	N/A	0.001	0.000	N/A	Pass
5	0.008	0.041	20.2	0.009	0.062	14.0	Pass
6	0.000	0.000	N/A	0.000	0.000	N/A	Pass
7	0.005	0.022	N/A	0.005	0.033	N/A	Pass
8	0.000	0.000	N/A	0.000	0.000	N/A	Pass
9	0.002	0.011	N/A	0.002	0.016	N/A	Pass
10	0.000	0.000	N/A	0.000	0.000	N/A	Pass
11	0.000	0.008	N/A	0.001	0.011	N/A	Pass
12	0.000	0.000	N/A	0.000	0.000	N/A	Pass
13	0.000	0.007	N/A	0.001	0.010	N/A	Pass
14	0.000	0.000	N/A	0.000	0.000	N/A	Pass
15	0.001	0.006	N/A	0.001	0.008	N/A	Pass
16	0.000	0.000	N/A	0.000	0.000	N/A	Pass
17	0.001	0.005	N/A	0.001	0.007	N/A	Pass
18	0.000	0.000	N/A	0.000	0.000	N/A	Pass
19	0.001	0.004	N/A	0.001	0.007	N/A	Pass
20	0.000	0.000	N/A	0.000	0.000	N/A	Pass
21	0.000	0.004	N/A	0.000	0.006	N/A	Pass
22	0.000	0.000	N/A	0.000	0.000	N/A	Pass
23	0.000	0.004	N/A	0.000	0.005	N/A	Pass
24	0.000	0.000	N/A	0.000	0.000	N/A	Pass
25	0.000	0.003	N/A	0.000	0.005	N/A	Pass
26	0.000	0.000	N/A	0.000	0.000	N/A	Pass
27	0.000	0.003	N/A	0.000	0.005	N/A	Pass
28	0.000	0.000	N/A	0.000	0.000	N/A	Pass
29	0.000	0.003	N/A	0.000	0.004	N/A	Pass
30	0.000	0.000	N/A	0.000	0.000	N/A	Pass
31	0.000	0.003	N/A	0.000	0.004	N/A	Pass
32	0.000	0.000	N/A	0.000	0.000	N/A	Pass
33	0.000	0.003	N/A	0.000	0.004	N/A	Pass
34	0.000	0.000	N/A	0.000	0.000	N/A	Pass
35	0.000	0.002	N/A	0.000	0.004	N/A	Pass
36	0.000	0.000	N/A	0.000	0.000	N/A	Pass
37	0.000	0.002	N/A	0.000	0.003	N/A	Pass
38	0.000	0.000	N/A	0.000	0.000	N/A	Pass
39	0.000	0.002	N/A	0.000	0.003	N/A	Pass
40	0.000	0.000	N/A	0.000	0.000	N/A	Pass

7. Voltage Fluctuations-Flicker

Test result: **PASS**

8.1 Block Diagram of Test Setup



8.2 Test Setup and Test Procedure

8.2.1 Definition

Flicker: impression of unsteadiness of visual sensation induced by a light stimulus whose luminance or spectral distribution fluctuates with time.

Pst: Short-term flicker severity.

Plt: long-term flicker severity.

dc: maximum steady state voltage change during an observation period.

dmax: maximum absolute voltage change during an observation period.

d(t): time function of the relative r.m.s. voltage change evaluated as a single value for each successive half period between zero-crossings of the source voltage, except during time interval in which the voltage is a steady-state condition for at least 1s.

8.2.2 Test condition

The EUT was set to produce the most unfavorable sequence of voltage changes.

8.3 Test Protocol

The tested object operated under the operating condition specified in EN 61000-3-3

The following limits apply

- the value of P_{st} shall not be greater than 1,0.
- the value of P_{lt} shall not be greater than 0,65.
- T_{max} , the accumulated time value of $d(t)$ with a deviation exceeding 3,3 % during a single voltage change at the EUT terminals, shall not exceed 500 ms.
- the maximum relative steady-state voltage change, dc , shall not exceed 3,3 %.
- the maximum relative voltage change d_{max} , shall not exceed:

4% without additional conditions.

6 % for equipment which is:

- switched manually, or
- switched automatically more frequently than twice per day, and also has either a delayed restart (the delay being not less than a few tens of seconds), or manual restart, after a power supply interruption.

7 % for equipment which is:

- attended whilst in use (for example: hair dryers, vacuum cleaners, kitchen equipment such as mixers, garden equipment such as lawn mowers, portable tools such as electric drills), or
- switched on automatically, or is intended to be switched on manually, no more than twice per day, and also has either a delayed restart (the delay being not less than a few tens of seconds) or manual restart, after a power supply interruption.

for manual switch, d_{max} is measured in accordance with Annex B of standard, average d_{max} is calculated from 24 times measurement.

No Limits shall apply to individual lamps.

Incandescent lamp luminaires with ratings less than or equal to 1000W and LED lamp luminaires with with ratings less than or equal to 600W, are deemed to comply with the d_c , d_{max} and T_{max} limits in the standard EN 61000-3-3 and are not required to be tested.

Ballasts are deemed to be part of luminaires and are not required to be tested.

8.4 Test Result

Parameter values recorded during the test:

Vrms at the end of test (Volt):

229.75

T-max (mS):

0

Test limit (mS):

500.0

Pass

Highest dc (%):

0.00

Test limit (%):

3.30

Pass

Highest dmax (%):

0.00

Test limit (%):

4.00

Pass

Highest P_{st} (10 min. period):

0.213

Test limit:

1.000

Pass

Immunity Test

Performance criteria

The performance criteria are based on the general criteria of the standard and derived from the product specification

Performance criterion A:

During the test, no change of the luminous intensity shall be observed and the regulating control, if any, shall operate during the test as intended.

Performance criterion B:

During the test the luminous intensity may change to any value. After the test, the luminous intensity shall be restored to its initial value within 1 min. Regulating controls need not function during the test, but after the test, the mode of the control shall be the same as before the test provided that during the test no mode changing commands were given.

Performance criterion C:

During and after the test, any change of the luminous intensity is allowed and the lamp(s) may be extinguished. After the test, within 30 min, all functions shall return to normal, if necessary by temporary interruption of the mains supply and/or operating the regulating control.

Additional requirement for lighting equipment incorporating a starting device: After the test, the lighting equipment is switched off. After half an hour it is switched on again. The lighting equipment shall start and operate as intended.

8. Electrostatic Discharge (ESD)

Test result: **PASS**

9.1 Severity Level and Performance Criterion

9.1.1 Test level

1a – Contact discharge		1b – Air discharge	
Level	Test voltage kV	Level	Test voltage kV
1	2	1	2
2	4	2	4
3	6	3	8
4	8	4	15
X	Special	X	Special

Notes:

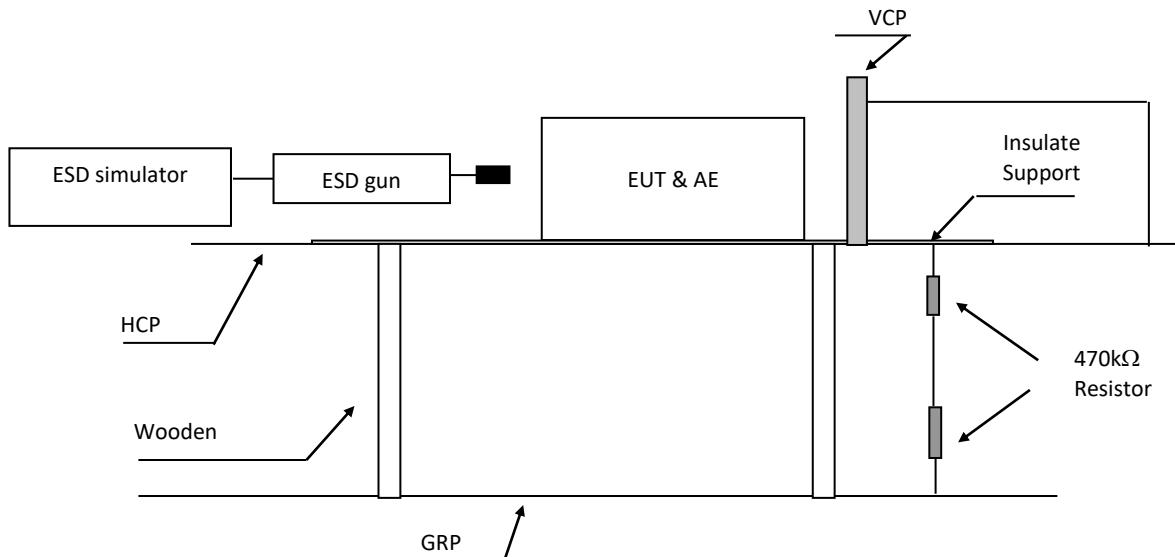
- 1.“X” is an open level. The level has to be specified in the dedicated equipment specification. If higher voltages than those shown are specified, special test equipment may be needed.
2. The gray rows were the selected test level.

9.1.2 Performance Criterion

Performance criterion: **B** (For emergency luminaires designed to operate in high-risk task areas, after the test, the luminous intensity shall be restored to its initial value within 0.5s.)

9.2 Block Diagram of Test Setup

For table-top equipment



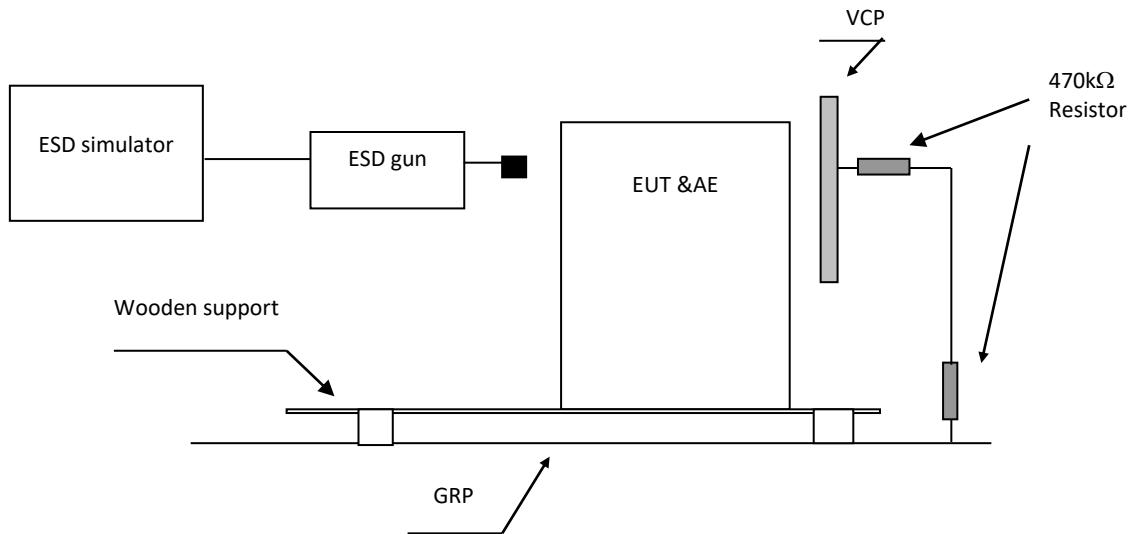
Note: HCP means Horizontal Coupling Plane

VCP means Vertical Coupling Plane

GRP means Ground Reference Plane

Wooden support is a 0.8m height table

For floor standing equipment



Note: VCP means Vertical Coupling Plane

GRP means Ground Reference Plane

Wooden support is a 0.1m height rack

9.3 Test Setup and Test Procedure

Measurement was performed in shielded room.

Measurement and setting of EUT was applied according to IEC 61000-4-2 Clause 7.

The test method and equipment was specified by IEC 61000-4-2 with the modifications by EN 61547 clause 5.2.

9.4 Test Protocol

Direct discharges were applied at the following selected points:

Test point #	Test level [kV]	Air/Contact	Polarity (+/-)	Pass/Fail/NA	Comment
A	2/4	Contact	+/-	Pass	All touchable screws of enclosure
B	2/4	Contact	+/-	Pass	Accessible metal parts of the EUT
C	2/4/8	Air	+/-	Pass	Air gap of the switch, button
D	2/4/8	Air	+/-	Pass	The air in-taking opening
E	2/4/8	Air	+/-	Pass	Slots around the EUT

Indirect contact discharges were applied to the VCP and the HCP at the following selected points:

For table top equipment

Point	Description	Point	Pass/Fail/NA
HCP f	0,1m from the front of the EUT	Edge of centre, corner on HCP	Pass
HCP b	0,1m from the back of the EUT	Edge of centre, corner on HCP	Pass
HCP r	0,1m from the right side of the EUT	Edge of centre, corner on HCP	Pass
HCP l	0,1m from the left side of the EUT	Edge of centre, corner on HCP	Pass
VCP f	0,1m from the front of the EUT	Edge of centre, corner on VCP	Pass
VCP b	0,1m from the back of the EUT	Edge of centre, corner on VCP	Pass
VCP r	0,1m from the right of the EUT	Edge of centre, corner on VCP	Pass
VCP l	0,1m from the left of the EUT	Edge of centre, corner on VCP	Pass

For floor standing equipment

Point	Description	Point	Pass/Fail/NA
VCP f	0,1m from the front of the EUT	Edge of centre, corner on VCP	-
VCP b	0,1m from the back of the EUT	Edge of centre, corner on VCP	-
VCP r	0,1m from the right of the EUT	Edge of centre, corner on VCP	-
VCP l	0,1m from the left of the EUT	Edge of centre, corner on VCP	-

Observation: All the functions were operated as normal during and after test.

Conclusion: The EUT met the requirements of Performance Criterion B.

9. Electromagnetic field susceptibility

Test result: **PASS**

10.1 Severity Level and Performance Criterion

10.1.1 Test level

Level	Test field strength V/m
1	1
2	3
3	10
X	Special

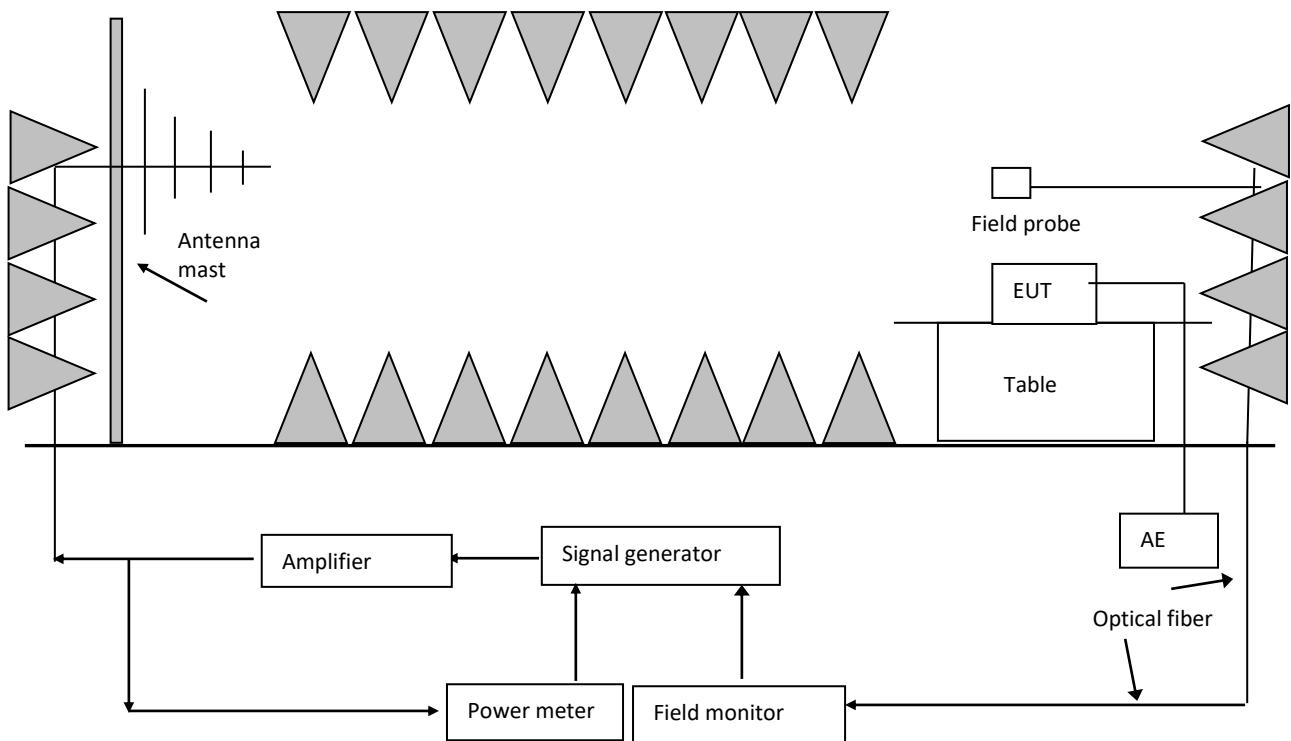
Notes:

1. X is an open test level. This level may be given in the product specification.
2. The gray row is the selected test level.

10.1.2 Performance Criterion

Performance criterion: **A**

10.2 Block diagram of test setup



10.3 Test Setup and Test Procedure

Measurement was performed in full-anechoic chamber.

Measurement and setting of EUT was applied according to IEC 61000-4-3 clause 7.

The test method and equipment was specified by IEC 61000-4-3 with additions and modifications by EN 61547 clause 5.3.

10.4 Test Protocol

Test no.:	Frequency (MHz)	Polarization	Test level V/m	Modulation	Exposed location	Pass/Fail/NA	Comment
1	80-1000	H & V	3	1kHz, 80%, SW, AM, 1% step size	All sides	Pass	-

Observation: All the functions were operated as normal during and after test.

Conclusion: The EUT met the requirements of Performance Criterion A.

10. Electric Fast Transient/Burst Immunity Test

Test result: **PASS**

11.1 Severity Level and Performance Criterion

11.1.1 Test level

Open circuit output test voltage ($\pm 10\%$) and repetition rate of the impulses ($\pm 20\%$)				
Level	On power port, PE		On I/O (input & output) signal, data and control ports	
	Voltage peak kV	Repetition rate kHz	Voltage peak kV	Repetition rate kHz
1	0.5	5 or 100	0.25	5 or 100
2	1	5 or 100	0.5	5 or 100
3	2	5 or 100	1	5 or 100
4	4	5 or 100	2	5 or 100
X	Special	Special	Special	Special

Notes :

- 1. "X" is an open level. The level has to be specified in the dedicated equipment specification.
- 2. The gray rows were the selected test level.

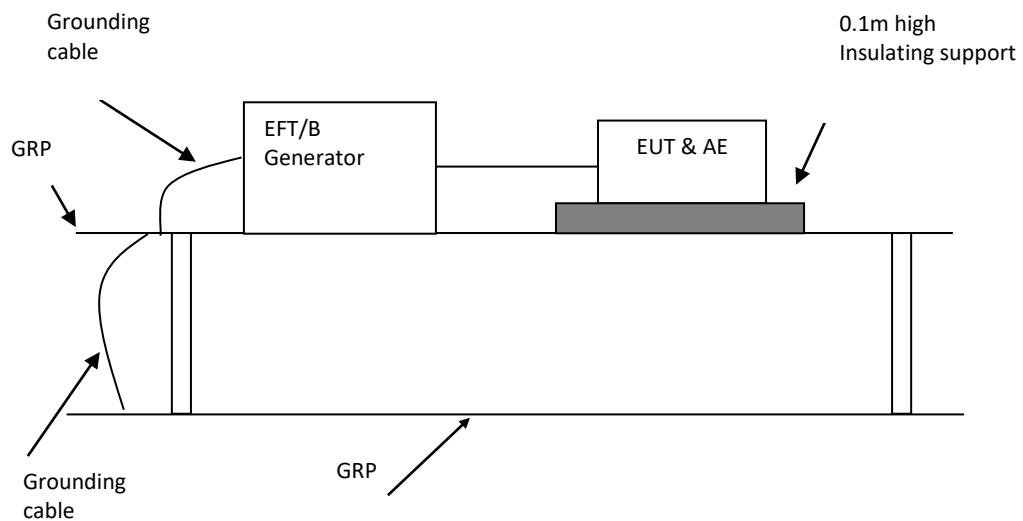
11.1.2 Performance Criterion

Performance criterion B (For emergency luminaires designed to operate in high-risk task areas, after the test, the luminous intensity shall be restored to its initial value within 0.5s.)

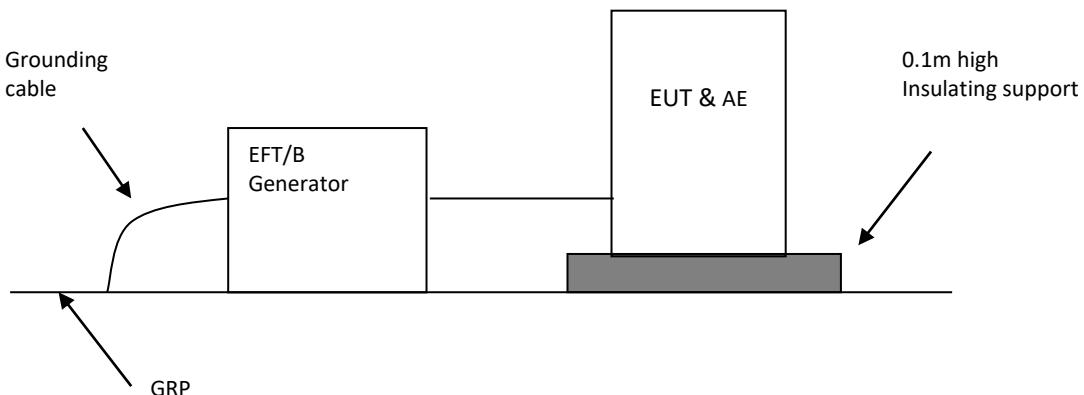
11.2 Block Diagram of Test Setup

11.2.1 Block Diagram for input a.c./d.c. power line

For table-top equipment

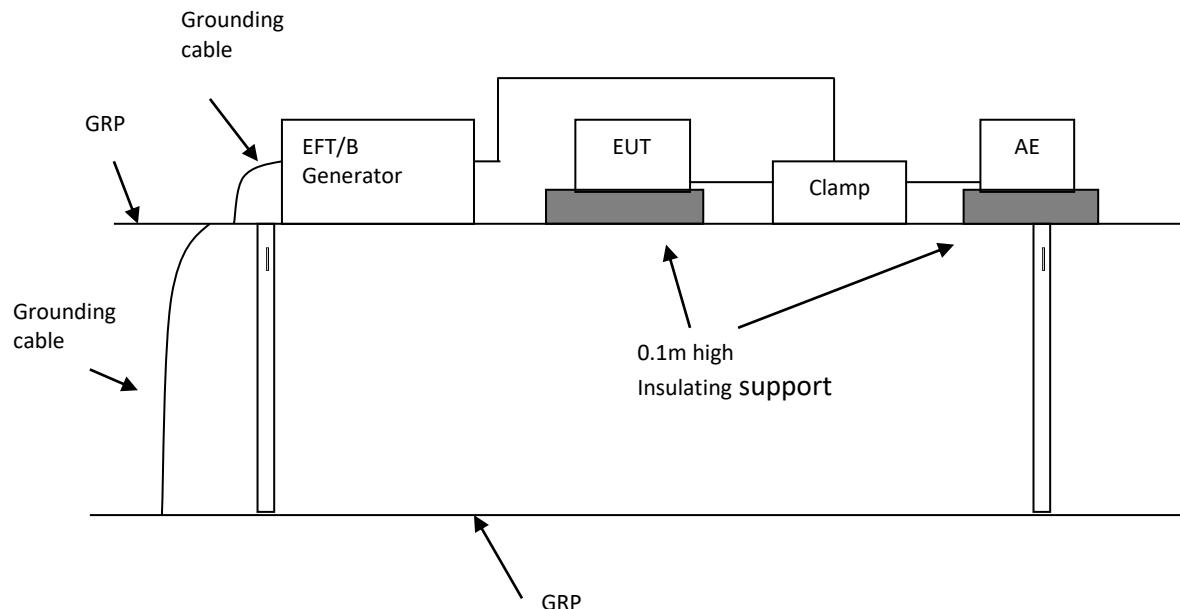


For floor standing equipment



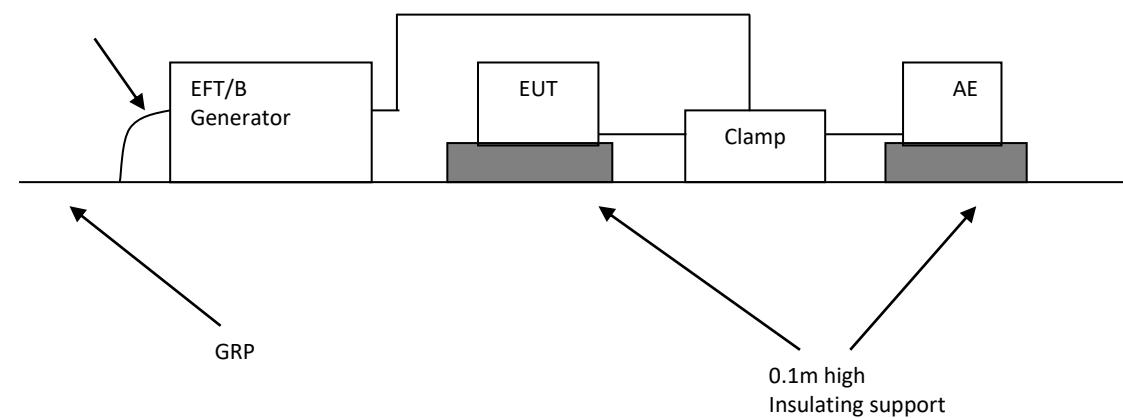
11.2.2 Block Diagram for output a.c./d.c. power line or signal/control lines

For table-top equipment



For floor standing equipment

Grounding cable



11.3 Test Setup and Test Procedure

Measurement was performed in shielded room.

Measurement and setting of EUT was applied according to IEC 61000-4-4 clause 7.

The test method and equipment was specified by IEC 61000-4-4 with additions and modifications by EN 61547 clause 5.5.

11.4 Test Protocol

Test No.	Level [kV]	Polarity +/-	Repetition rate kHz	Line for test	Pass/Fail/NA
1	1	+/-	5	a.c. power ports	Pass
2	0.5	+/-	5	d.c. power ports	NA
3	0.5	+/-	5	Signal lines and control lines	NA

Observation: All the functions were operated as normal during and after test.

Conclusion: The EUT met the requirements of Performance Criterion B.

11. Surge Immunity Test

Test result: **PASS**

12.1 Severity Level and Performance Criterion

12.1.1 Test level

Level	Open-circuit test voltage $\pm 10\%$ kV
1	0.5
2	1.0
3	2.0
4	4.0
X*	Special

Notes:

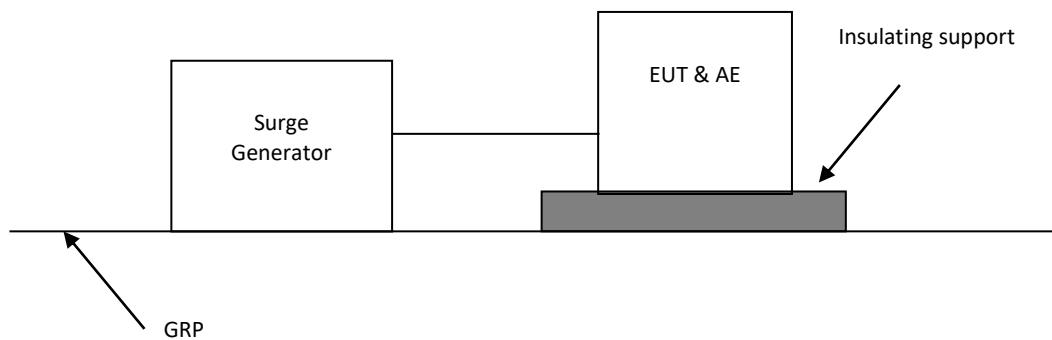
- 1."X" is an open class. This level can be specified in the product Specification
2. The gray rows are the selected level.

12.1.2 Performance Criterion

Performance criterion **B**: Luminaires for emergency lighting(For emergency luminaires designed to operate in high-risk task areas, after the test, the luminous intensity shall be restored to its initial value within 0.5s.).

Performance criterion **C**: Others.

12.2 Block Diagram of Test Setup



12.3 Test Setup and Test Procedure

Measurement was performed in shielded room.

Measurement and setting of EUT was applied according to IEC 61000-4-5 clause 7.

The test method and equipment was specified by IEC 61000-4-5 with modifications by EN 61547 clause 5.7.

12.4 Test Protocol

Test No.	Level [kV]	Polarity +/-	Angle	Line for test	Pass/Fail/NA
1	0.5	+	90 ⁰	a.c. Mains (line to line)	NA
2	0.5	-	270 ⁰	a.c. Mains (line to line)	NA
3	1	+	90 ⁰	a.c. Mains (line to earth)	NA
4	1	-	270 ⁰	a.c. Mains (line to earth)	NA
5	1	+	90 ⁰	a.c. Mains (line to line)	Pass
6	1	-	270 ⁰	a.c. Mains (line to line)	Pass
7	2	+	90 ⁰	a.c. Mains (line to earth)	NA
8	2	-	270 ⁰	a.c. Mains (line to earth)	NA

Observation: All the functions were operated as normal during and after test.

Conclusion: The EUT met the requirements of Performance Criterion B.

12. Immunity to Conducted Disturbances, Induced by Radio-frequency Fields

Test result: **PASS**

13.1 Severity Level and Performance Criterion

13.1.1 Test level

Frequency range 150kHz – 80MHz		
Level	Voltage level (e.m.f.)	
	U_0 [dB(uV)]	U_0 (V)
1	120	1
2	130	3
3	140	10
X	Special	Special

Notes:

1. "X" is an open level.
2. The gray row is the selected test level.

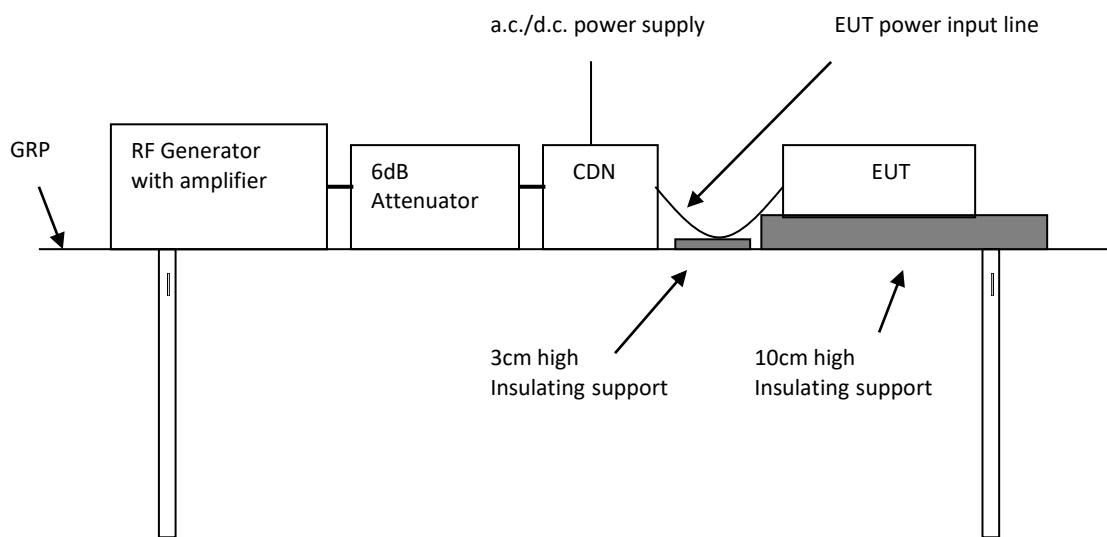
13.1.2 Performance Criterion

Performance criterion: **A**

13.2 Block Diagram of Test Setup

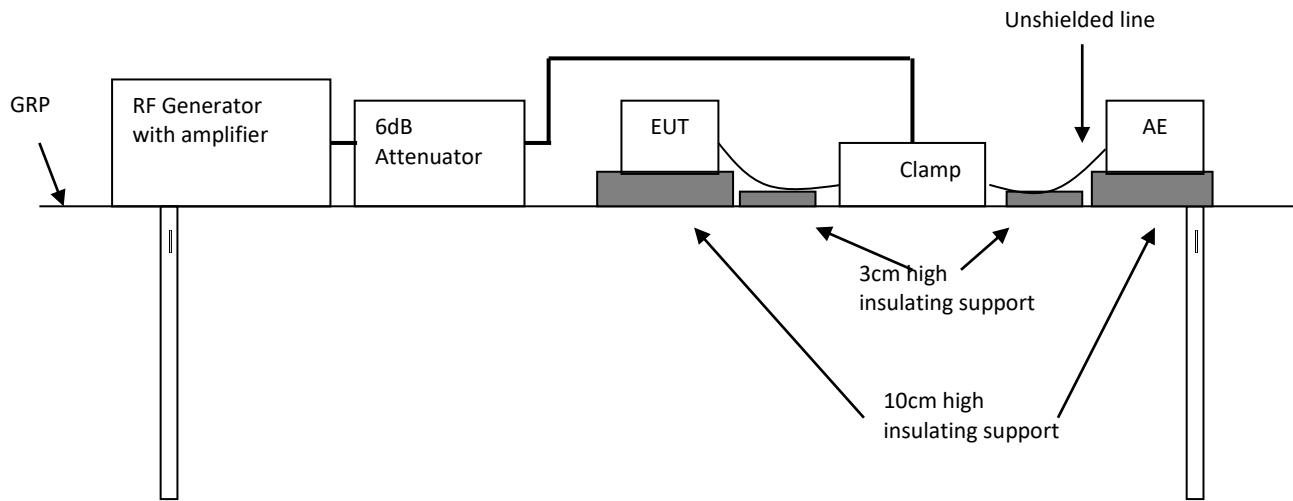
13.2.1 Block Diagram for a.c./d.c input power line

Block Diagram for a.c./d.c input power line

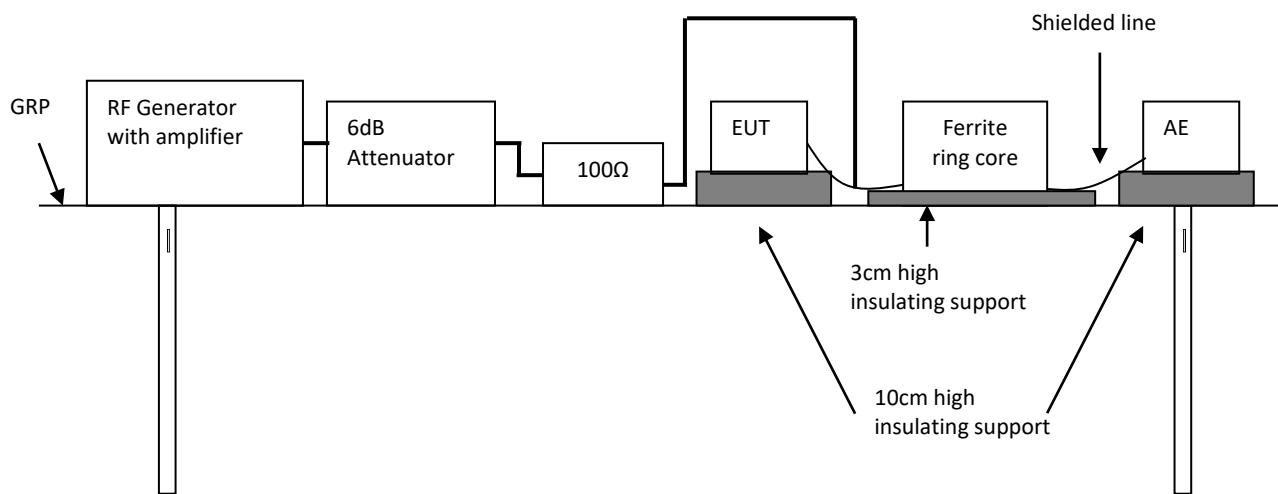


13.2.2 Block Diagram for output a.c./d.c. power line or signal/control lines

Unshielded line



Shielded line



13.3 Test Setup and Test Procedure

Measurement was performed in shielded room.

Measurement and setting of EUT was applied according to IEC 61000-4-6 clause 7.

The test method and equipment was specified by IEC 61000-4-6 with additions and modifications by EN 61547 clause 5.6.

13.4 Test Protocol

Test No.	Frequency (MHz)	Level V (r.m.s.)	Modulation	Injected point	Pass/Fail/NA
1	0.15~80	3	1kHz, 80%, SW, AM, 1% step size	a.c. Mains	Pass
2	0.15~80	1	1kHz, 80%, SW, AM, 1% step size	d.c. power ports	NA
3	0.15~80	1	1kHz, 80%, SW, AM, 1% step size	signal lines and control lines	NA

Observation: All the functions were operated as normal during and after test.

Conclusion: The EUT met the requirements of Performance Criterion A.

13. Voltage Dips, Short Interruptions and Voltage Variations Immunity Test

Test result: **PASS**

14.1 Severity Level and Performance Criterion

14.1.1 Test level

Test level % U _T	Voltage dip and short interruptions % U _T	Duration (in period)
0	100	0.5*
		250
40	60	25
		10
70	30	0.5
		10
		X **

Notes:

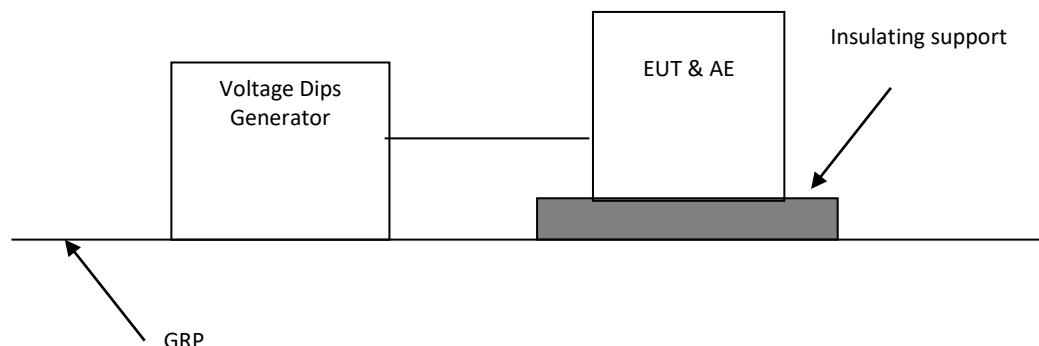
1. “**” for 0.5 period, the test shall be made in positive and negative polarity, i.e. starting at 0° and 180°, respectively.
2. “**” means “x” is an open duration. This duration can be given in the product specification. Utilities in Europe have measured dips and short interruptions of duration between $\frac{1}{2}$ a period and 3000 periods, but duration less than 50 periods are most common.
3. If the EUT is tested for voltage dips of 100%, it is generally unnecessary to test for other levels for the same durations. However, for some cases (safeguard systems or electro-mechanical devices) it is not true. The product specification or product committee shall give an indication of the applicability of this note.
4. The gray rows are selected test level.

14.1.2 Performance Criterion

Performance criterion: C at the test level 70%.

Performance criterion: B at the test level 0% (For ballasts where the lamp is not able to restart within 1 min, due to the physical constraints of the lamp performance criterion C applies. For luminaires where the lamp is not able to restart within 1 min, due to the physical constraints of the lamp, performance criterion C applies.).

14.2 Block diagram of test setup



14.3 Test Setup and Test Procedure

Measurement was performed in shielded room.

Measurement and setting of EUT was applied according to IEC 61000-4-11 clause 7.

The test method and equipment was specified by IEC 61000-4-11 with additions and modifications by EN 61547 clause 5.8.

14.4 Test Protocol

Test no.	% U _T	Voltage dip and short interruptions % U _T	Duration (in periods)	Pass/Fail/NA
1	70	30%	10	Pass
2	0	100% pos half cycle	0,5	Pass
3	0	100% neg half cycle	0,5	Pass

Observation: All the functions were operated as normal during and after test.

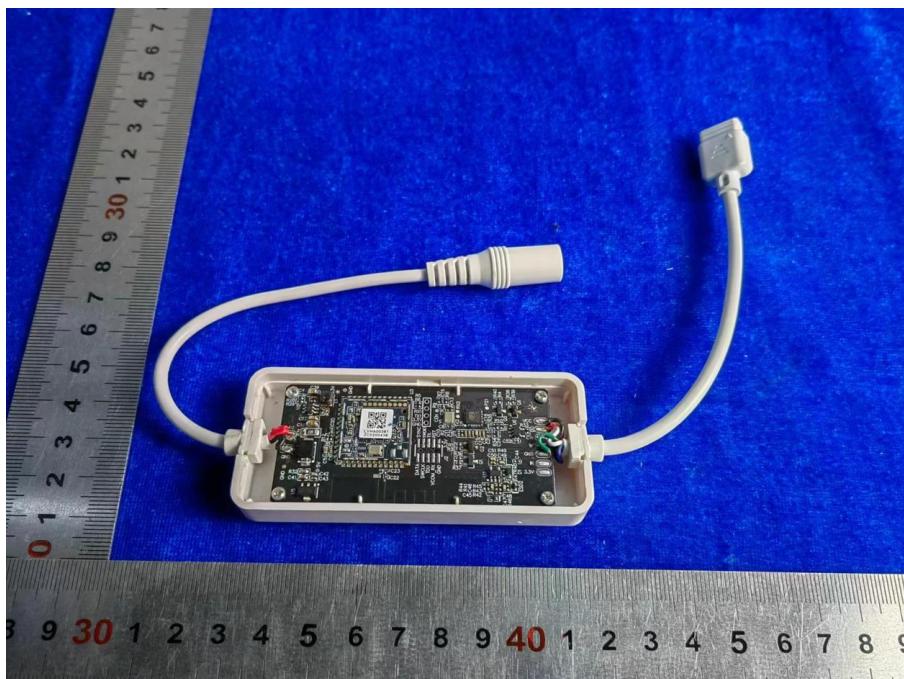
Conclusion: The EUT met the requirements of Performance Criterion B.

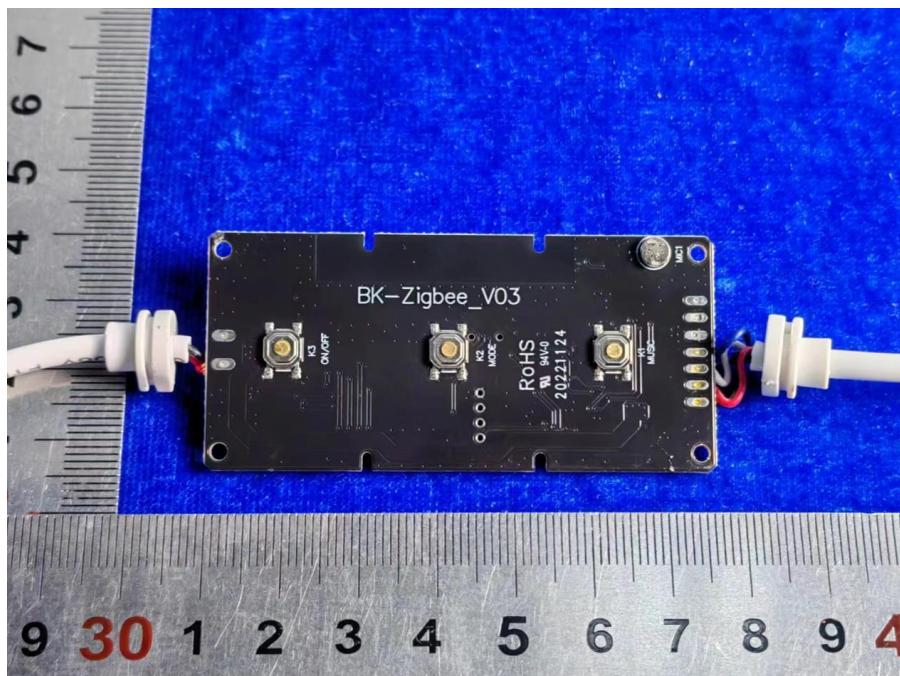
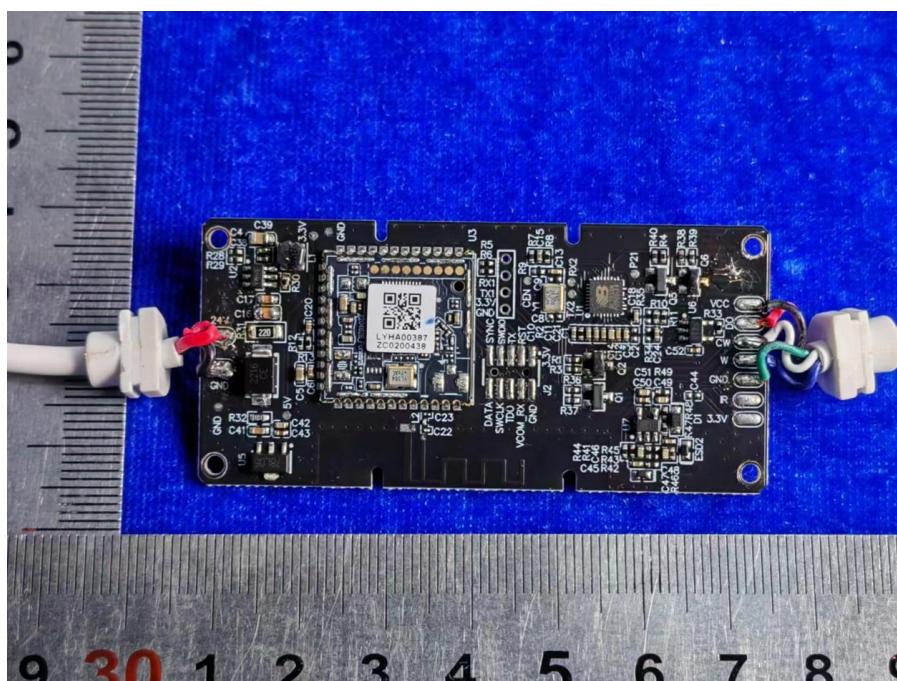
Appendix I: Photograph of equipment under test

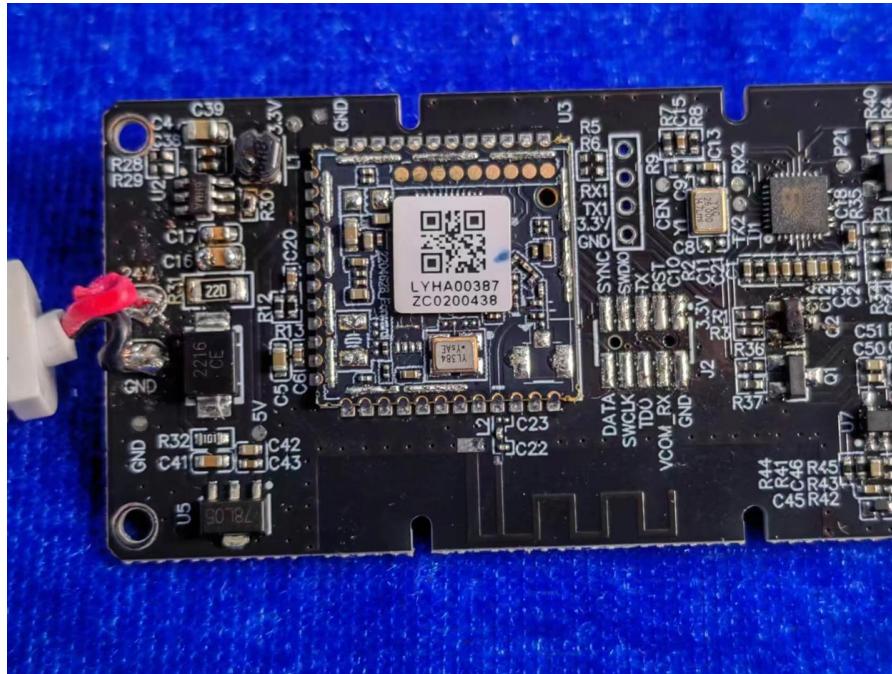
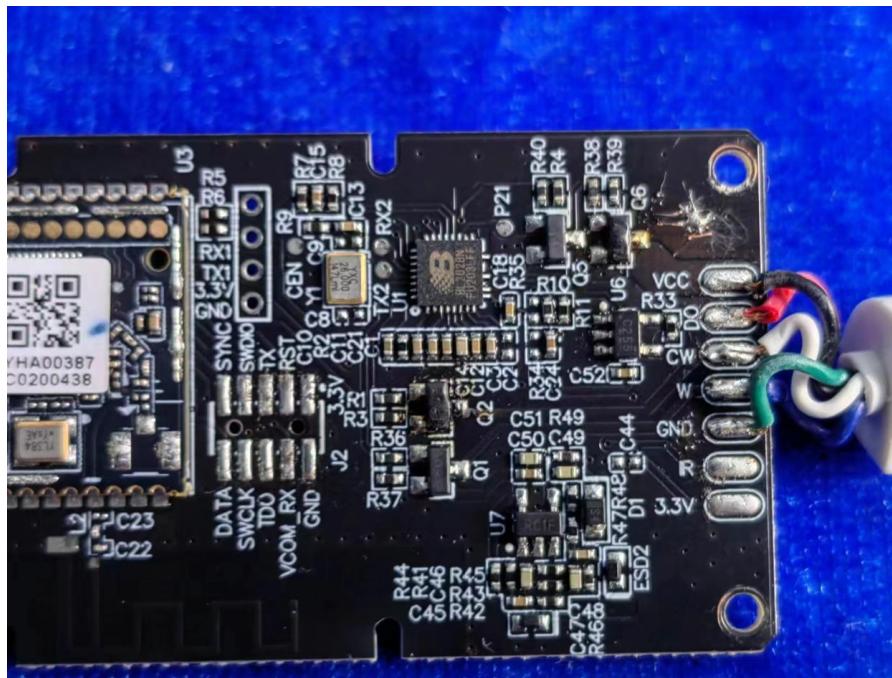












***** END *****